

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

1
F76
C2



United States Department of Agriculture • Forest Service



USDA LIBRARY
NAT'L AGRIC LIBRARY
2001 MAR 14 P 2:54
CURRENT SERIAL RECORD
ACQ/SERIALS BRANCH

REPORT OF THE FOREST SERVICE • FISCAL YEAR 1990



The Forest Service

The Forest Service, U.S. Department of Agriculture, is responsible for Federal leadership in Forestry. It carries out this role through four main activities:

- Protection and management of resources on 191 million acres of National Forest System lands.
 - Research on all aspects of forestry, rangeland management, and forest resources utilization.
 - Cooperation with State and local governments, forest industries, and private landowners to help protect and manage non-Federal forest and associated range and watershed lands.
 - Participation with other agencies in human resource and community assistance programs to improve living conditions in rural areas.
-

SELECTED 1990 STATISTICS

Receipts	\$1.69 Billion
Expenditures	\$3.58 Billion
Permanent Full-time Employees	32,375
National Forest System	191 Million Acres
Mineral Cases Processed	25,927
Timber Sold	9.3 Billion Board Feet
Timber Harvested	10.5 Billion Board Feet
Reforestation	498 Thousand Acres
Grazing Permits Administered	10,527
Livestock Grazing	9.6 Million Animal Unit Months
Recreation Use	263 Million Visitor Days
Trail System	114,366 Miles
National Scenic Byways	3,800 Miles
National Wild and Scenic Rivers System	3,369 Miles
Wilderness	33.3 Million Acres
Wildlife and Fish Habitat Improvements	489,100 Acres
Watershed Improvements	33,816 Acres
Road System	363,000 Miles
National Forest System Lands Burned	422 Thousand Acres
Insect and Disease Suppression	1.7 Million Acres
Woodland Owners Assisted	148,673
Research Publications	2,165
Human Resource Programs	125,949 Persons Served



United States
Department of
Agriculture

Forest Service
Washington, DC

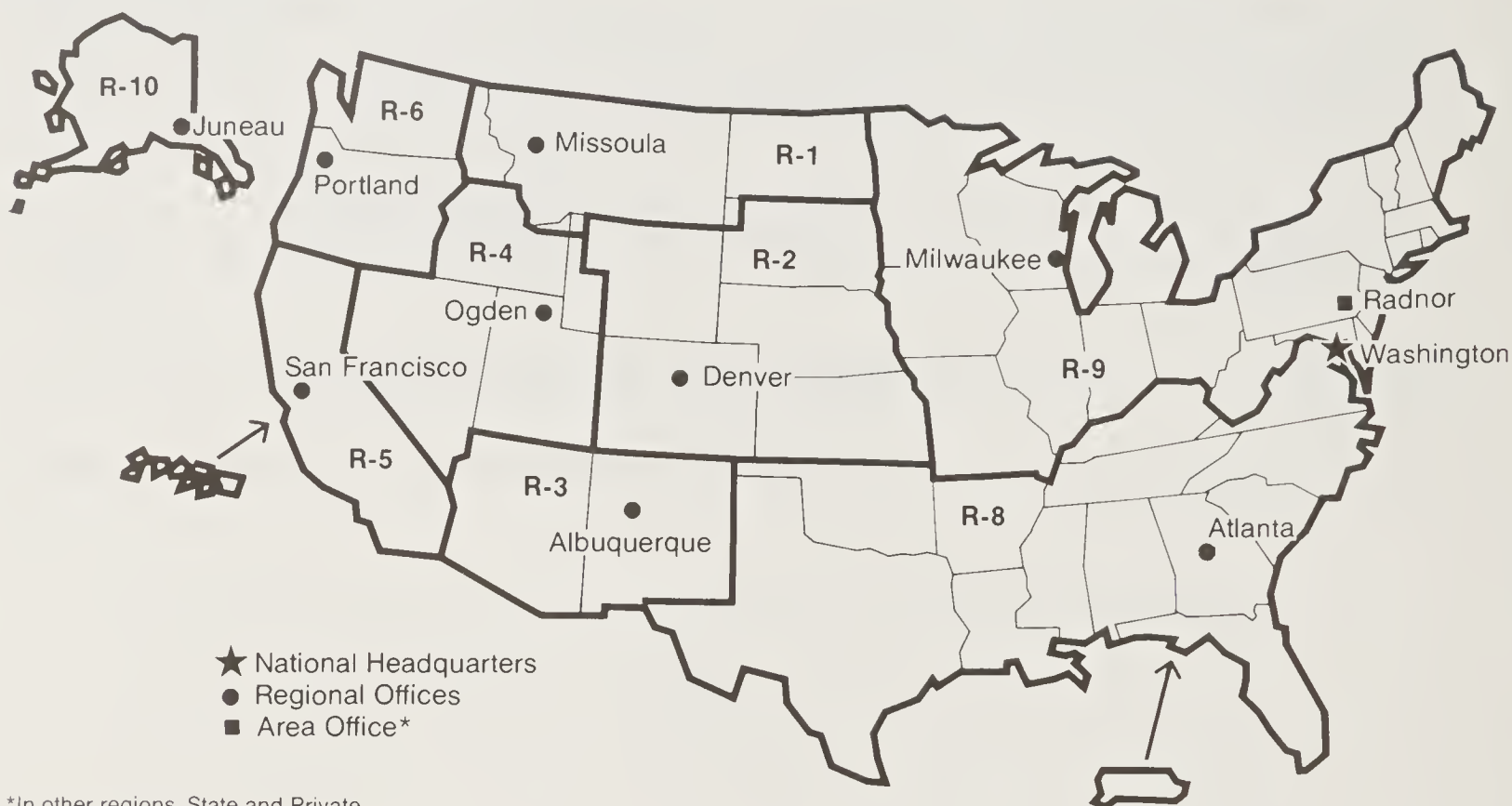
February 1991

REPORT OF THE FOREST SERVICE Fiscal Year 1990

Report of the Forest Service

Figure 1.

National Forest Systems Regional Offices State and Private Forestry Area Office*



*In other regions, State and Private Forestry activities are directed from Regional Offices.

Regional Offices

**Forest Service, USDA
Northern Region (R-1)**
Federal Building
P.O. Box 7669
Missoula, MT 59807
406-329-3511

**Forest Service, USDA
Rocky Mountain Region (R-2)**
11177 West 8th Avenue
P.O. Box 25127
Lakewood, CO 80225
303-236-9431

**Forest Service, USDA
Southwestern Region (R-3)**
Federal Building
517 Gold Avenue, S.W.
Albuquerque, NM 87102
505-842-3292

**Forest Service, USDA
Intermountain Region (R-4)**
Federal Building
324 25th Street
Ogden, UT 84401
801-625-5352

**Forest Service, USDA
Pacific Southwest Region (R-5)**
630 Sansome Street
San Francisco, CA 94111
415-705-2870

**Forest Service, USDA
Pacific Northwest Region (R-6)**
319 S.W. Pine Street
P.O. Box 3623
Portland, OR 97208
503-326-2971

**Forest Service, USDA
Southern Region (R-8)**
1720 Peachtree Road, N.W.
Atlanta, GA 30367
404-347-2384

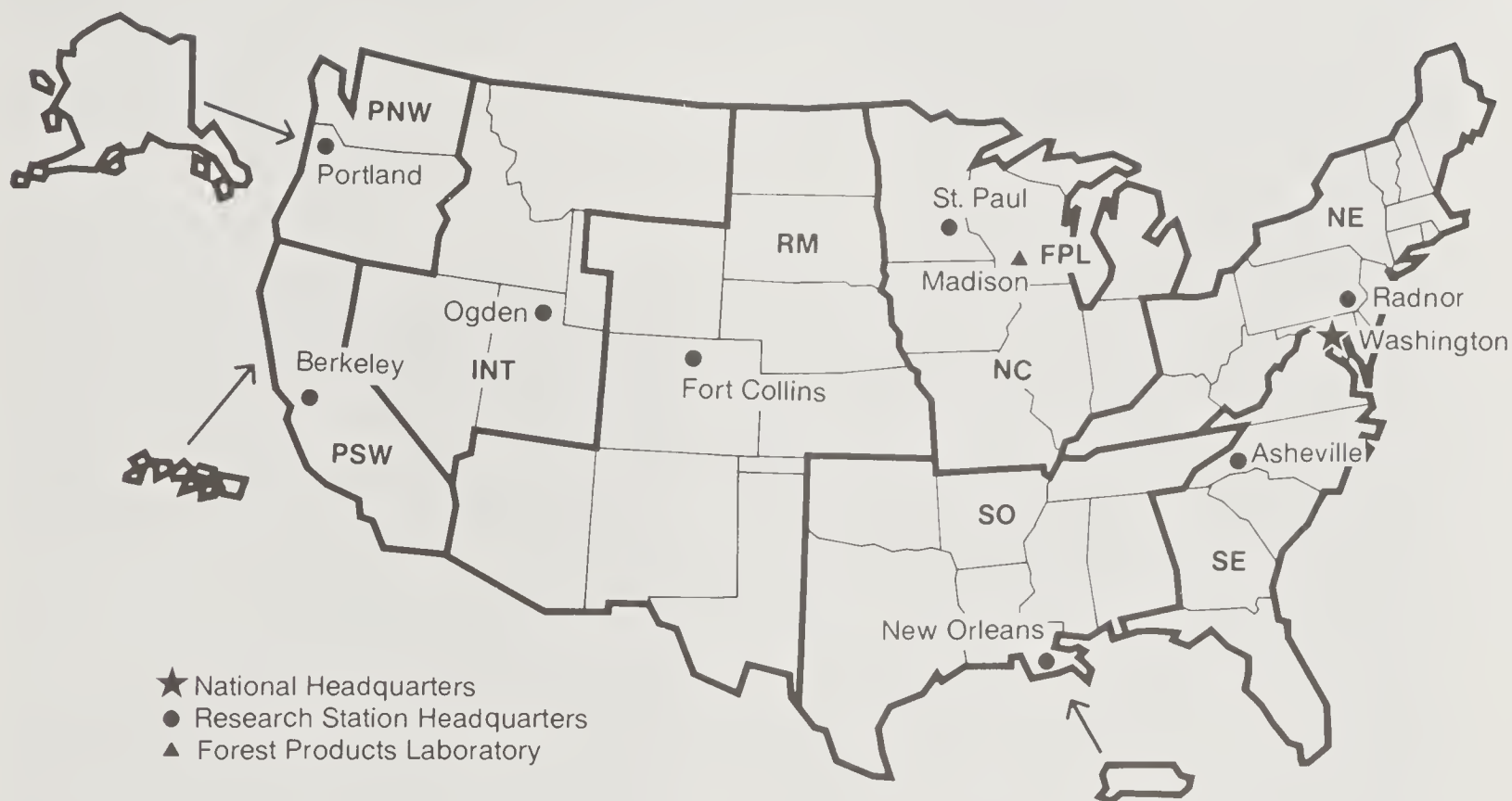
**Forest Service, USDA
Eastern Region (R-9)**
310 West Wisconsin Ave., Rm. 500
Milwaukee, WI 53203
414-297-3693

**Forest Service, USDA
Alaska Region (R-10)**
P.O. Box 21628
Juneau, AK 99802-1628
8-907-586-8863

Area Office

**Forest Service, USDA
Northeastern Area—S&PF**
5 Radnor Corporate Center
100 Matsonford Rd., Suite 200
Radnor, PA 19087
215-975-4111

Figure 2.
Research



National Headquarters

Send all mail except Express Mail to this address:
Forest Service—USDA
14th & Independence Ave., S.W.
Washington, DC 20090-6090
202-447-3957

Send Express Mail to this address:
Chief, Forest Service
U.S. Department of Agriculture
14th & Independence Ave., S.W.
Washington, DC 20250

Research Station Headquarters

Intermountain Forest and Range Experiment Station (INT)
Federal Building
324 25th Street
Ogden, UT 84401
801-625-5412

North Central Forest Experiment Station (NC)

1992 Folwell Avenue
St. Paul, MN 55108
612-649-5000

Northeastern Forest Experiment Station (NE)

5 Radnor Corporate Center
100 Matsonford Rd., Suite 200
Radnor, PA 19087
215-975-4222

Pacific Northwest Forest and Range Experiment Station (PNW)

P.O. Box 3890
Portland, OR 97208
503-326-5640

Pacific Southwest Forest and Range Experiment Station (PSW)

1960 Addison Street
P.O. Box 245 (94701)
Berkeley, CA 94704
415-486-3292

Rocky Mountain Forest and Range Experiment Station (RM)

240 West Prospect Road
Fort Collins, CO 80526-2098
303-498-1100

Southeastern Forest Experiment Station (SE)

200 Weaver Blvd.
P.O. Box 2680
Asheville, NC 28802
704-257-4390

Southern Forest Experiment Station (SO)

Room T-10210
U.S. Postal Service Building
701 Loyola Avenue
New Orleans, LA 70113
504-589-6800

Forest Products Laboratory (FPL)

One Gifford Pinchot Drive
Madison, WI 53705-2398
608-231-9200



CHIEF'S MESSAGE

This was an exciting, productive, and challenging year for the Forest Service.

As we celebrated the 30th anniversary of the Multiple Use-Sustained Yield Act, the debate and controversy grew even more intense over the "proper balance" in managing the national forests and grasslands. The debate and controversy focused on tough issues like the spotted owl and other threatened or endangered species, old growth forests, clearcutting, below-cost timber sales, roadless areas, and biological diversity. Stimulated by this controversy, the Forest Service made good progress in 1990 in chartering our future.

The 1989 RPA Assessment and 1990 RPA Program were sent to Congress with President Bush saying it was "a bold, strategic plan for the conservation and wise use of the Nation's national forests and grasslands including assistance to State and Private Forestry and Research." The RPA Program strongly reinforced sustainable multiple-use management, but with a better balance among resource uses and greater sensitivity to environmental values. The forest plans were completed on most national forests after more than 10 years of hard work. These plans chart the future management of the national forests and grasslands over the next 10 to 15 years.

The Forest Service initiated the New Perspectives program, which is aimed at managing national forests for a broader spectrum of uses and values on a sustainable, ecological basis. To do this, we are forging new partnerships between researchers and land managers in order to bring together the new research knowledge about forest ecosystems and on-the-ground management experience.

When all of this is added up, it means strong reinforcement of sustainable, multiple-use management of the national forests and grasslands—but with a difference! Higher priority is being put on fishery, wildlife, and outdoor recreation. Timber, mining, and grazing will continue to be a very important part of multiple-use, but will be undertaken in a more environmentally sensitive manner.



Photo by Jill Bauermeister

This was a year of tremendous progress in State and Private Forestry. The 1990 Farm Bill broadens our authority to work with State Foresters in providing incentives for good stewardship of private, nonindustrial forest lands. Also, our authority was expanded in urban and community forestry, especially in providing assistance in planting and caring for trees in the cities. The Forest Service is proud to be playing a key role in implementing President Bush's tree planting program.

In 1991, we look forward to celebrating the 100th anniversary of the founding of the National Forest System. Many activities are planned throughout the year to get the American people more in touch with their national forests. We hope you get involved.

F. DALE ROBERTSON
Chief



Photo by Faith Skoog



F.S. Photo



CONTENTS

Chief's Message	4	Forest Research	81
Introduction	8	The Research Mission	82
Caring for the Land and Serving People	9	National Problems	82
Legislative Basis for the Report	9	Foundation Programs	86
The Resources Planning Act Program		International Forestry	94
and Assessment	13	Administration	97
The Forest Service Pathway into the '90's		Improving Agency Productivity	98
and Beyond	14	Managing the Human Resource	98
Major Findings of the 1989 RPA Assessment	14	Human Resource Programs	98
The 1990 RPA Program	16	Law Enforcement	101
National Forest System	25	Managing the Capital Resource	101
Introduction	26	Managing the Information Resource	102
Multiple-Use Management--Changing		Keeping People Informed and Involved	102
Emphasis in Uses	26	Tables	107
Land Management Planning	32	Index	108
Minerals	35	National Forest System	111
Lands	37	State and Private Forestry	178
Forest Management	39	Forest Research	199
Range	45	Administration	204
Recreation, Wilderness, and Cultural		Index	217
Resource Management	47		
Wildlife and Fish	52		
Soil, Water, Air, and Weather	55		
Federal Facilities Compliance Program	58		
Forest Road System	58		
Engineering Support	62		
State and Private Forestry	67		
Introduction	68		
Fire and Aviation Management	68		
Forest Pest Management	72		
Forest Management and Utilization	74		
Special Projects	78		



INTRODUCTION

Caring for the Land and Serving People



F.S. Photo



Photo by Faith Skoog



Photo by Jim Hughes

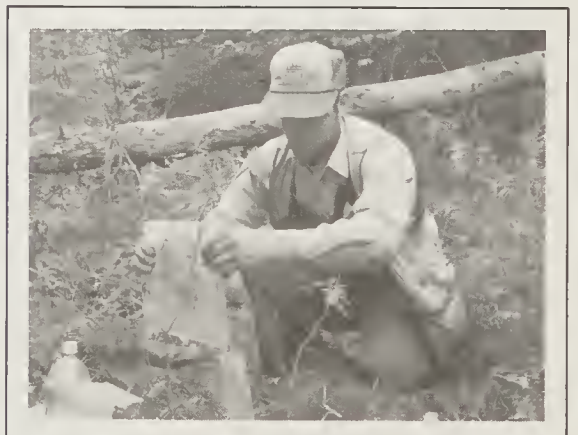


Photo by Mary Sales

CARING FOR THE LAND AND SERVING PEOPLE

Our Mission

The Forest Service is dedicated to conserving the resources and the environmental benefits of our Nation's forests and rangelands. We manage the national forests and grasslands to serve the needs of the people who own them, and we share them and conserve them for future generations. We work with State forestry organizations to help private landowners apply good forestry practices on their lands. We conduct research to find better ways to manage and use our Nation's renewable resources. The 1897 Organic Administration Act, which created the Forest Service, states that "no national forest shall be established, except to improve and protect the forest within the boundaries." That is a mission we continue to pursue.

Multiple-Use Management

Meeting the demands of people for forest and rangeland resources, while conserving those resources for future needs, requires judicious multiple-use management. The Forest Service aims for a balance of resource values and land uses most beneficial in the long term for the most people. This is a productive approach, but also one that makes wise, protective, and conservative use of resources. Rooted in statute and century-old public land management philosophy, multiple-use management has served the Nation well and will continue in our stewardship of 156 national forests (123 administrative units), 83 experimental forests and ranges, 19 grasslands, and 15 land-use projects.

We are providing multiple-use management assistance to State and private landowners through our State and Private Forestry programs. Through research, we are also providing scientific support, leading to increased compatibility among resource uses and an enlightened understanding about how ecosystems work.

The Challenge

Public demand for use of the Nation's forests and grasslands on national forests and other ownerships is strong and complex; in recent years, competition between and among consumptive uses and nonconsumptive (amenity) uses has increased. Now the demand for clean water sometimes vies with timber use, livestock use, or elk hunting; similarly, the preservation of wilderness sometimes competes with developed recreation uses. These competitive demands are reflected through contemporary issues and debate.

The Forest Service's responses to such issues and debate follow the multiple-use management principle of balancing competing resource influences and demands to provide the greatest resource benefits for the broadest segment of the

American people. In following this principle, the Forest Service strives to encourage public participation. To ensure that the interests of future generations are considered, we assess trends in resources performance, along with long-term demands and preferences of the American people, and we prepare the RPA Program to respond to the long-term output needs as we also meet current needs and preferences.

1990 RPA Program

In looking to the future, the 1990 RPA Program provides a long-term strategic plan that includes four major themes:

- Enhanced recreation, wildlife, and fisheries resources.
- Environmentally acceptable commodity production.
- Improved scientific knowledge.
- Response to global resource issues.

The 1990 RPA Program renews and reinvigorates the Forest Service's commitment to multiple-use management and responds to the need for environmental sensitivity and sustained production of a diverse array of resources. These goals apply to all Forest Service programs within the National Forest System, State and Private Forestry, and Research. The Resources Planning Act Program and Assessment chapter of this report discusses the 1990 RPA Program in greater detail. The last four chapters describe the Forest Service's 1990 program performance accomplishments for the National Forest System, State and Private Forestry, Research, and Administration. These chapters relate program accomplishments to the issues and themes addressed in the 1990 RPA Program.

In addition to meeting the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, this report includes accomplishments and outputs in relation to commitments in the appropriated Forest Service budget. We inventory and assess the forest and grassland resources, monitor their management, and report regularly to the American people on their use, performance, productivity, and health.

LEGISLATIVE BASIS FOR THE ANNUAL REPORT

The Forest and Rangeland Renewable Resources Planning Act, as amended, directs the Secretary of Agriculture to submit to Congress an annual report on Forest Service performance and accomplishments in carrying out the RPA Program in response to congressional direction and budget allocation.¹

Required in the annual report are the following:

- A description of the status of major research programs, significant findings, and the applications of these programs.

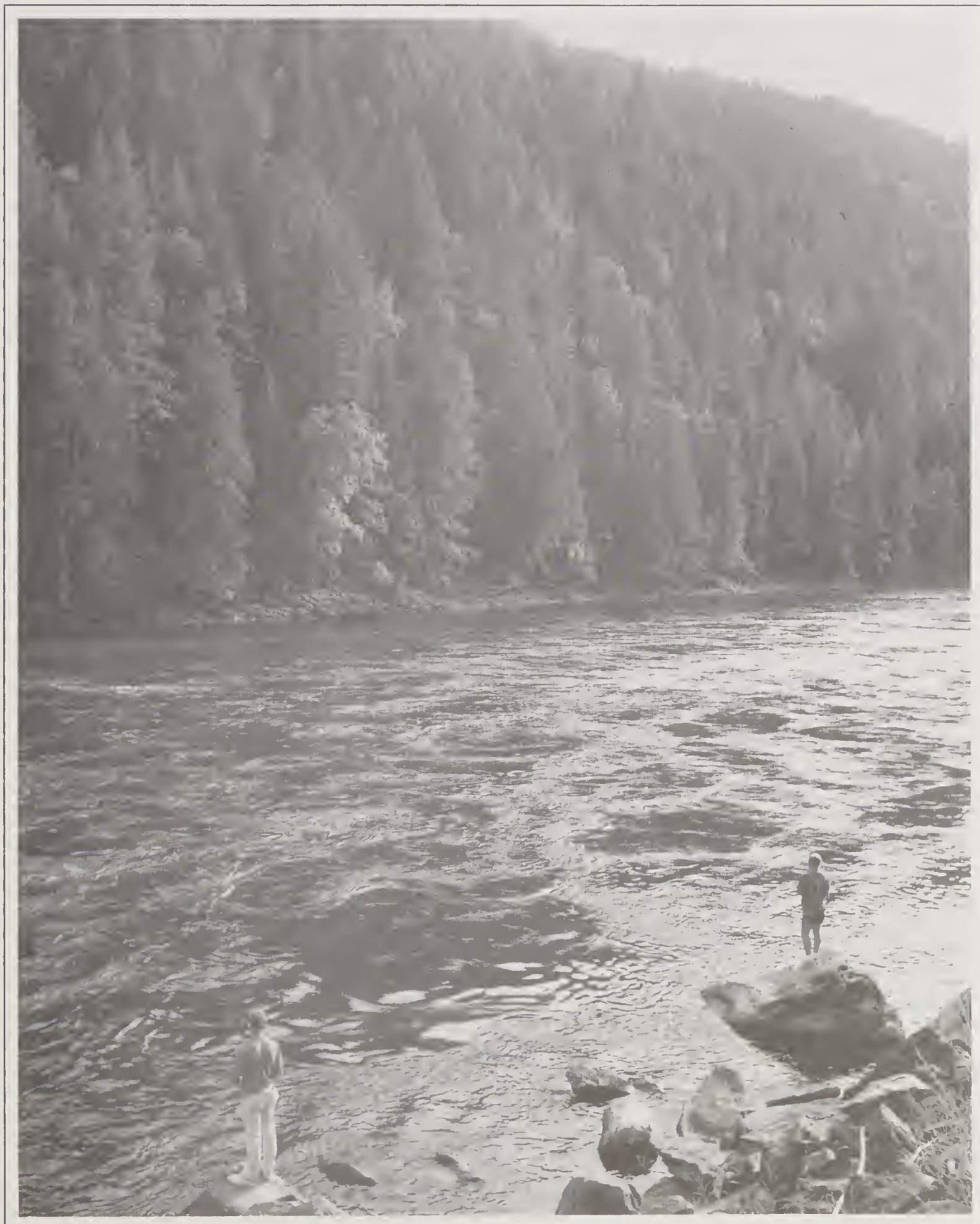
Report of the Forest Service

- A description of the accomplishments, status, needs, and work backlogs of cooperative forestry assistance.
- A status report on how well mandated standards and guidelines in the forest land and resource management plans (forest plans) are being met.
- A timber sale comparison, based on a representative sample, of estimated expenditures for reforestation, timber stand improvement, and timber sale preparation, with estimated receipts to the Treasury.
- An identification, based on a representative sample, of advertised timber sales made below the estimated expenditures.

This document also includes the following reports that Congress requires at the time of the annual report:

- A report identifying the amount and location, by forest, State, and productivity class, of (1) all lands identified in the forest plans requiring reforestation and (2) all forested lands not growing at their best potential.
- An estimate of funding to plant all cutover acres successfully.
- A report on the type and quantity of pesticide use in the National Forest System, including beneficial or adverse effects.

¹ Unless otherwise stated, all references to years in the report are fiscal years.







THE RESOURCES PLANNING ACT PROGRAM AND ASSESSMENT

Forest Service Pathway into the '90's and Beyond



Photo by Carey Given

FOREST SERVICE PATHWAY INTO THE '90'S AND BEYOND

Under the authority of the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, the Forest Service develops a comprehensive Assessment of the Nation's renewable resources every 10 years and a recommended Forest Service Program every 5 years. The most recent Assessment, published in 1989, described the Nation's forest and rangeland renewable resources and minerals situation and projected supplies of and demands for these resources. The 1990 RPA Program, released in June 1990, is a national long-range strategic plan guiding the Forest Service's National Forest System, State and Private Forestry, and Research programs.

MAJOR FINDINGS OF THE 1989 RPA ASSESSMENT

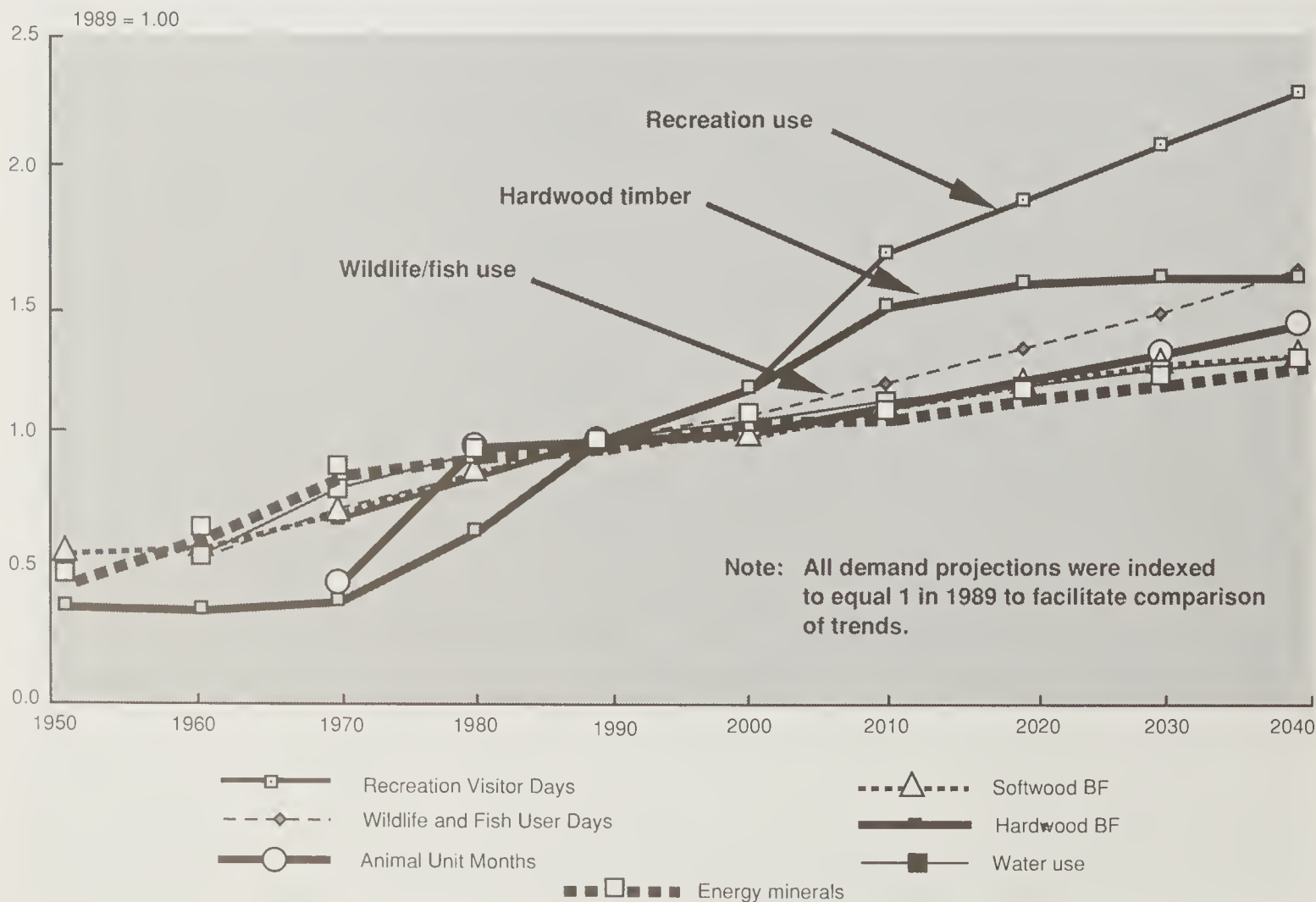
The 1989 Assessment's analysis of resource conditions and supply and demand trends provides a factual basis for developing resource management strategies for the future, including the 1990 RPA Program. The 1989 Assessment comprises a

summary document; detailed technical analyses of the land base, minerals, outdoor recreation and wilderness, range forage, timber, water, and wildlife and fish; and additional documents describing the basic assumptions for the Assessment, Forest Service programs and responsibilities, resource-use history, resource interactions, and global climate change.

The following general conclusions are derived from the 1989 Assessment:

- The demand for all resources is increasing.
- The Nation will probably meet future resource demands, but sustainable management of some resources may be a significant challenge.
- Demand is increasing for amenity outputs from both public and private lands.
- Pressure is increasing on private lands to supply both commodity and amenity outputs.

Figure 3.
Index of 1989 RPA Assessment Demand Projection



1989 Assessment Findings by Resource Area

Figure 3 shows an index of current and projected demands for the various renewable resources. Although demand for all resources is expected to continue to rise, relative increases are expected to be greater for recreation, wildlife and fish, and hardwood timber. More specific findings summarized by resource area follow below.

Recreation and Wilderness. Demand for most recreation activities is projected to increase. Recreation patterns will be influenced by demographic changes such as population growth, geographic shifts, increasing age, and ethnicity. Public access to private lands has declined—a trend that is likely to create additional land use pressures in the East, where there is less public land available for recreation than in the West. There also will be increasing pressure on the National Wilderness Preservation System.

Timber. The need for timber will increase. The demand for hardwoods is expected to rise nearly 80 percent by 2040, while

the demand for softwoods is expected to rise 35 percent by 2040. Nonindustrial private forest lands will provide a relatively greater share as well as a greater amount of timber supply in the future. Domestic hardwood supplies should be adequate in the future, even though technological advances are leading to more uses of hardwoods. The expected increase in wastepaper recycling will extend future supplies. Domestic softwood sawtimber supplies, on the other hand, are likely to be in short supply and accompanied by rising prices for the next 20 years.

Wildlife and Fish. The wildlife and fish situation is mixed. Big-game populations are projected to remain stable or increase and should be able to satisfy consumptive and nonconsumptive demands. Small-game populations that rely on agricultural habitats are declining. With the exception of geese, numbers of migratory birds also are declining. The demand for fishing is projected to double by 2040. Fishery habitat will need to be improved to support populations capable of meeting increased demands. The number of species listed as threatened and endangered is projected to continue to increase.



Chuck Frear and his daughter fish at Timothy Lake on the Mount Hood National Forest in Oregon. Facilities like this barrier-free pier will help provide a greater mix of recreational opportunities. Photo by Tom Iraci

Report of the Forest Service

Range. A 5-percent increase in the rangeland base, combined with increased technology, will enable forage supply to increase at about the same rate as forage demand for domestic livestock. Although range condition has generally improved in recent decades, significant portions of rangeland remain in unsatisfactory condition. Increasing demand for domestic livestock forage, along with increased competition from wildlife, could affect further improvements in rangeland condition.

Water. Demands for all uses of ground water and surface water will increase over the next 50 years. Most regions' water supplies are expected to be adequate, but five western water basins may experience water shortages. The shortages will have the greatest impact on water use for irrigated agriculture. Point-source pollution control efforts have improved water quality, but nonpoint sources need to be controlled to continue water-quality improvements.

Minerals. The Nation has abundant reserves of coal, oil shale, tar sands, and uranium, as well as potential for geothermal steam. Energy prices and the demand for fuels are both expected to continue to increase. The development costs and security of supply of many metallic minerals are uncertain.



Loblolly seedlings are handplanted using dibble bars on the DeSoto National Forest in Mississippi. Photo by Barry Nehr

THE 1990 RPA PROGRAM

The 1990 RPA Program is the Secretary of Agriculture's recommendation to Congress for the long-term direction of Forest Service programs. The RPA Program is based on many considerations, including 1989 Assessment findings, current and future Forest Service roles, and extensive public and private participation. State and Federal agency, local government, interest group, public and private sector individual, and Forest Service employee comments on the Draft Program were analyzed and incorporated into the 1990 RPA Program. Figure 4 compares 1990 resource outputs with projected RPA Program outputs for 1995 and 2040.

The 1990 Program strongly renews the Forest Service's commitment to multiple-use management, emphasizing a broad spectrum of uses, improved balance among resource uses, and environmental sensitivity. The primary themes are the following:

- Enhanced recreation, wildlife, and fisheries resources.
- Environmentally acceptable commodity production.
- Improved scientific knowledge.
- Response to global resource issues.

The 1990 RPA Program addresses management and administration of the National Forest System, assistance and leadership on State and private lands, and Forest Service research for a 50-year period stretching from 1990 to 2040. The program provides policy guidance for more specific and intensive planning accomplished through national forest plans, statewide forest resource plans, and research plans.

The President's Statement of Policy asserts that the 1990 Program is a "bold, strategic plan for the conservation and wise use of the Nation's national forests and grasslands including assistance to State and Private Forestry and Research." The President's statement recognizes the ambitious nature of the 1990 RPA Program. Managing and sustaining resources for future generations will require combinations of Federal spending and innovative new financing programs. Working together with existing and new partners from the public and private sectors will ensure that the Nation's resources are well managed and sustained in the future.

Transition to the 1990 Program

The 1990 Program's changed format and content integrate forest service roles, responses to contemporary issues, and program strategies rather than providing specific details about activities and resource outputs. More specifically, changes in the 1990 RPA Program are reflected in the organization of this annual report and the data included. First, RPA Program data are provided beginning in 1995 rather than for each year of the program's 5-year life span. Second, the 1990 RPA Program

The Resources Planning Act Program and Assessment

Figure 4.

1990 RPA PROGRAM GOALS FOR THE USDA FOREST SERVICE

	1990 Resource Output	1995 Resource Output	Percent Change from 1990	2040 Resource Output	Percent Change from 1990
<u>NATIONAL FOREST SYSTEM</u>					
Minerals (operations)	25,927.0	37,899.0	46.2	38,126.0	47.1
Recreation use (million visitor/user days) ¹	263.1	308.0	17.1	531.4	102.0
Trail construction (miles)	1,328.0	2,396.0	80.4	1,471.0	10.8
Wilderness (thousand acres)	33,200.0	35,350.0	6.5	39,064.0	17.7
Range grazing (million AUM)	9.6	9.3	-3.1	9.2	-4.2
Range condition (thousand acres in satisfactory condition)	37,557.0 ²	N/A	N/A	52,606.0	40.1
Timber offered (billion board feet)	11.1	10.8	-2.7	12.0	8.1
Clearcut harvests (thousand acres)	229.2	265.0	15.6	233.0	1.7
Wildlife & fish (million user days) ¹	42.0	48.9	16.4	119.8	185.2
Air-quality monitoring (number sites)	247.0	362.0	46.6	636.0	157.5
<u>STATE & PRIVATE FORESTRY</u>					
Timber stand improvement (thousand acres)	187.0	870.0	365.2	1,000.0	434.8
Multiresource management plans (thousand acres)	3,504.0	9,000.0	156.8	11,800.0	236.8
Tree planting (thousand acres)	887.0	1,300.0	46.6	800.0	-9.8
<u>RESEARCH</u>					
Recreation, wildlife, water (% total cost)	25.0	26.0	4.0	29.0	16.0
Timber, forest products (% total cost)	35.0	32.0	-8.6	30.0	-14.3
Forest economics, inventory (% total cost)	17.0	18.0	5.9	18.0	5.9
Forest protection (% total cost)	23.0	24.0	4.3	23.0	0.0
¹ Includes wildlife and fish (million user days). ² Estimate based on 1989.					

does not use the high-low bound projection format found in the 1985 RPA Program. Third, the following section describes program implications drawn from an analysis of the 1989 Assessment findings. Finally, discussion of the RPA Program is organized by program themes.

Implications of the 1989 Assessment Findings for the 1990 Program

The 1989 Assessment findings were used to categorize important resource situations as acceptable, impaired, or uncertain. This process helped develop a strong tie between the Assessment and the Program. The analysis was based on ecological, social, and economic impacts.

Acceptable resource situations can be expected to lead to a sustainable resource situation without unacceptable negative environmental impacts. Acceptable resource situations include range forage productivity, technology for utilization of timber, recycling of metallic minerals and wastepaper, and big-game habitat and population.

Impaired resource situations could lead to resource depletion or significant negative environmental impacts. Impaired resource situations include recreation opportunities, unsatisfactory range-land conditions, softwood timber age-class distributions, timber management of nonindustrial private ownerships, nonpoint-source water pollution, regional water supplies, fish habitat and populations, and wetland and riparian areas.

Uncertain resource situations are potentially threatening unless given immediate attention; and there is uncertainty about the magnitude of future impacts coupled with imperfect knowledge about managing the situation. Uncertain resource situations include the status of threatened and endangered species, biological diversity, global climate change, and compatibility and conflict among multiple resource uses.



A recreation officer from South Carolina's Sumter National Forest provides hikers with trail information. Recreational capabilities will be expanded by bringing all trails and facilities up to an acceptable standard. Photo by Barry Nehr

1990 Program Themes

Enhanced recreation, wildlife, and fish resources

The National Forest System will expand recreation and wilderness programs and wildlife and fisheries management significantly between 1990 and 2040 (figure 5). Recreation and trail facilities will be upgraded to acceptable standards (figures 6, 7, and 8); and recreation capabilities will be increased through expanded partnerships and volunteer programs. Changing demographics will affect the mix of recreation opportunities on national forests. Seven million acres will be added to the wilderness system by 2040. Wildlife and fish habitat capabilities on National Forest System lands will be expanded through investments and management to provide increased hunting, fishing, and nonconsumptive-use experiences, particularly anadromous fish habitat. Threatened and endangered species recovery goals will be aggressively pursued (figure 9). Sensitive species management objectives will be emphasized to avoid further listings.

State and Private Forestry will provide additional technical and financial assistance to nonindustrial private landowners, consistent with their objectives, to stimulate their production of recreation, wildlife, fisheries, and water resources, as well as of timber. For example, there will be increased assistance for the preparation of multiple-resource forest management plans. Integrated resource management will be encouraged through a new Stewardship Initiative.

Research will increase efforts to understand the habitat requirements of all species, particularly threatened and endangered species, and will focus on developing management techniques that increase compatibility among the multiple resources on all lands.

Figure 5.
Recreation Use, Including Wildlife and Fish

Million Recreation Visitor/Wildlife and Fish User Days (RVDs, WFUDs)

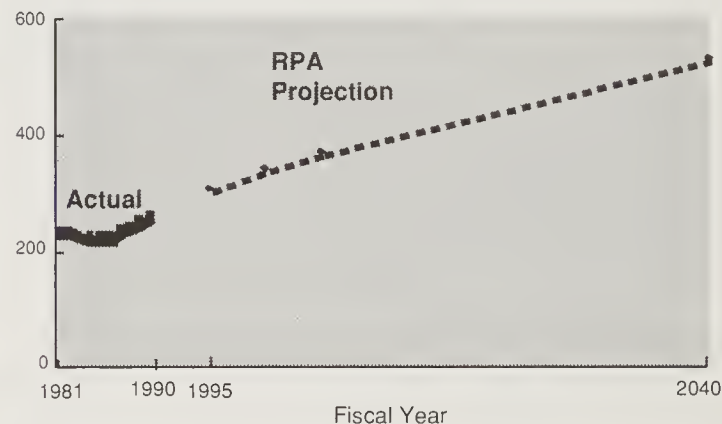
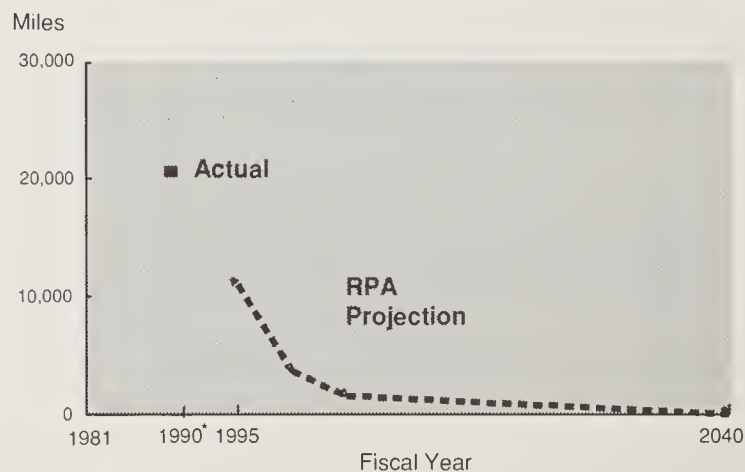
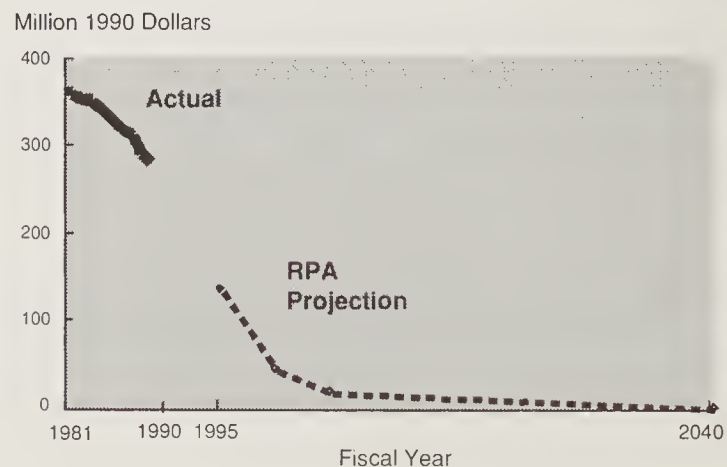


Figure 6.
Trail Backlog



* Estimated based on 1989.

Figure 7.
Recreation Facility/Backlog



The Resources Planning Act Program and Assessment

Figure 8.

Recreation Use—Standard and Less Than Standard

Percent Standard and Less Than Standard, Excluding Wildlife and Fish Use

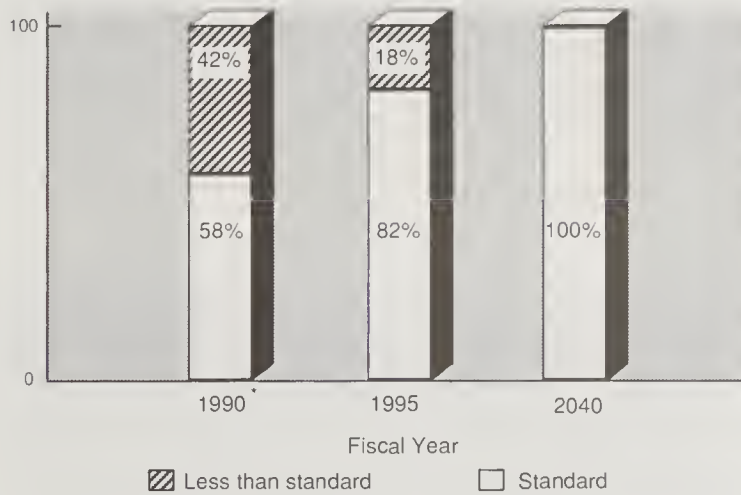
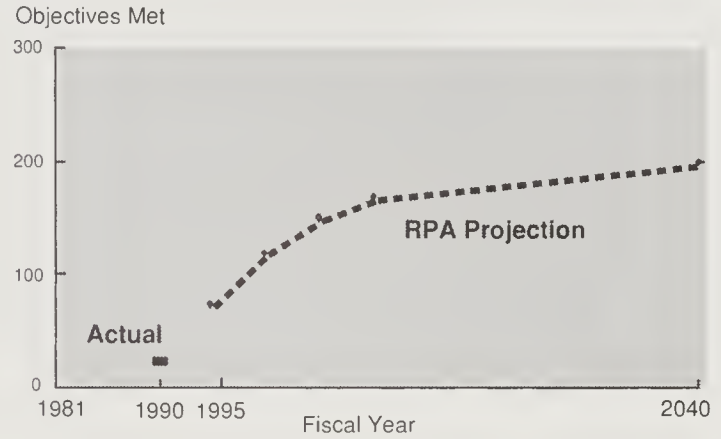


Figure 9.

National Forest System Threatened and Endangered Species Accomplishments



Note: Forest Service objectives for threatened and endangered species are based on Fish and Wildlife Service recovery plans and on interim management strategies developed by the Forest Service for species without recovery plans.



Improved scientific research about ecosystem dynamics improves the Forest Service's ability to manage wildlife habitat effectively.
F.S. Photo

Environmentally acceptable commodity production

Resource production on National Forest System lands will be accompanied by increased environmental sensitivity. The nationwide level of timber production will be adjusted downward to provide for habitat needs of threatened, endangered, and sensitive species; reduced below-cost timber sales; and more ecologically sensitive management (figure 10). Harvesting-level changes will vary regionally. The Forest Service will emphasize partial-cutting harvesting methods and will reduce clearcutting (figure 11). The quality and sustainability of rangelands will be improved, and there will be minor reductions in livestock grazing until rangelands are improved to a satisfactory condition.

Figure 10.
Total Timber Offered

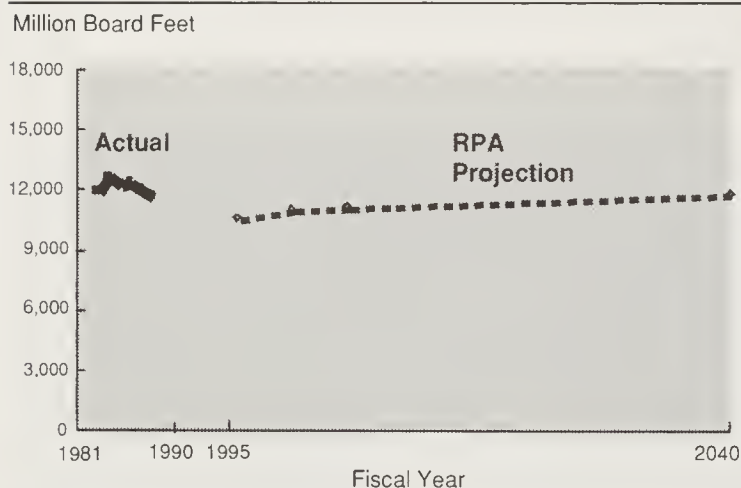
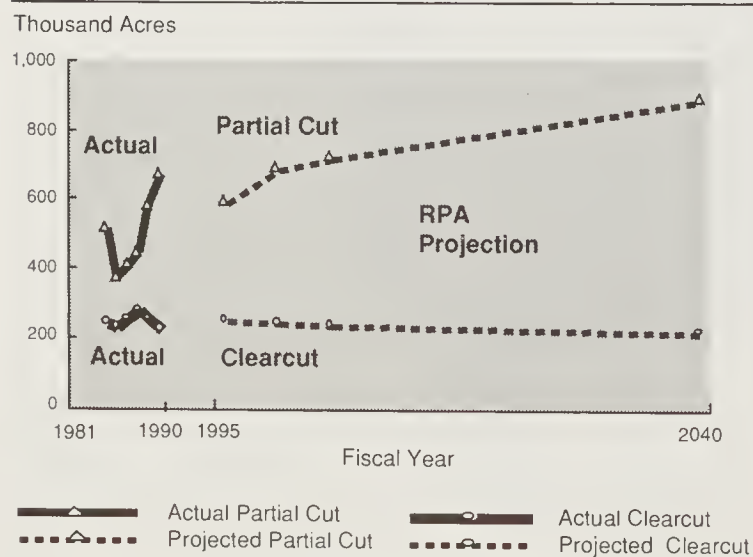


Figure 11.
Clearcut and Partial Cut Harvests

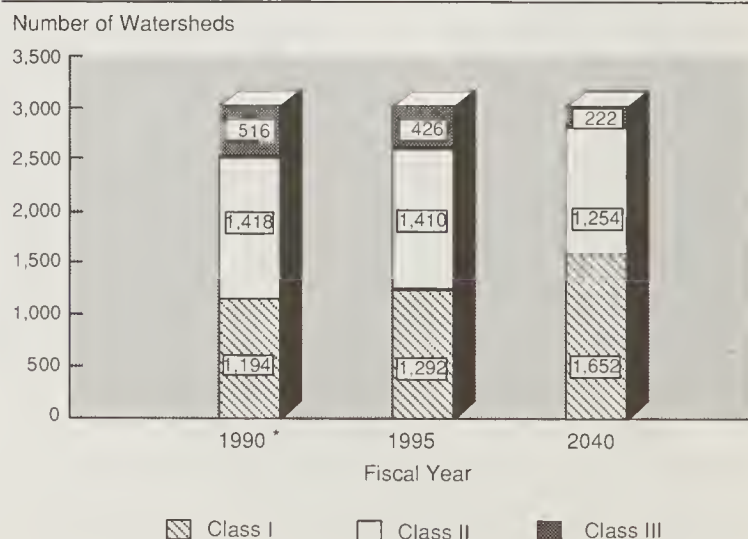


Access for minerals development will be increased where it can be done in an environmentally acceptable manner. Soil and water management efforts will emphasize improving watershed conditions (figure 12), implementing a national program for riparian area conservation, and controlling nonpoint-source water pollution. Air-quality protection will increase significantly by 1995 and throughout the RPA Program's 50-year horizon (figure 13).



The Modoc National Forest's Lassen Creek riparian habitat was restored between 1983 (above) and 1990 (right). Stream protection structures and a new grazing system enable commodity production to be combined with environmental protection. Photo by Richard Jones

Figure 12.
National Forest System Watershed Condition



* Estimated based on 1989.

The Resources Planning Act Program and Assessment

State and Private Forestry will increase technical and financial assistance for timber production on nonindustrial private forests. More specifically, State-Federal cooperative programs will plant trees on 1.3 million acres annually through 2010, and then on 800,000 acres annually through 2040 (figure 14). Timber stand improvements and timber harvest assistance will increase significantly. Programs will emphasize integrated management and stewardship of all resources (figure 15).

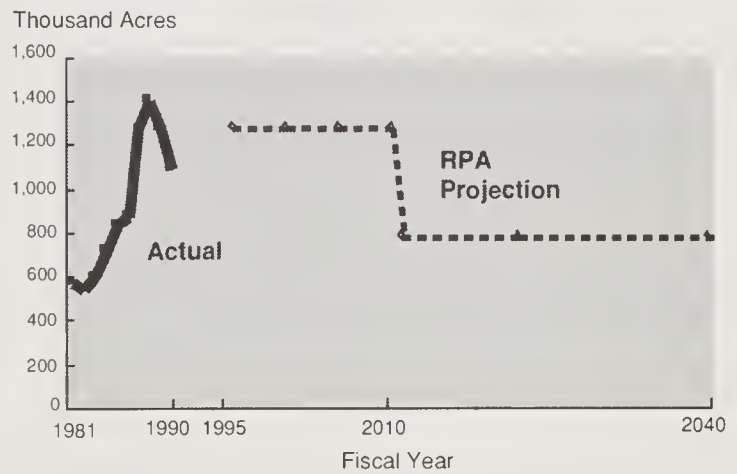


Photo by Sydney Smith

Research will focus on developing environmentally sensitive resource management techniques. Coordination of resource inventories will be enhanced and improved.

Figure 14.

Total Reforestation on Nonindustrial Private Forest (NIPF) Lands and Projected Accomplishments with S&PF Assistance



Note: Total reforestation on NIPF lands includes acreage from state incentives programs, landowner assistance by industry, consultants, and unassisted owners in addition to acreage assisted with State-Federal cooperative (S&PF) programs. RPA projection includes only the portion assisted by S&PF programs. Of the 1.1 million acres shown for 1990 actual, 887 thousand acres were assisted by S&PF programs.

Figure 13.

Air-Quality Monitoring

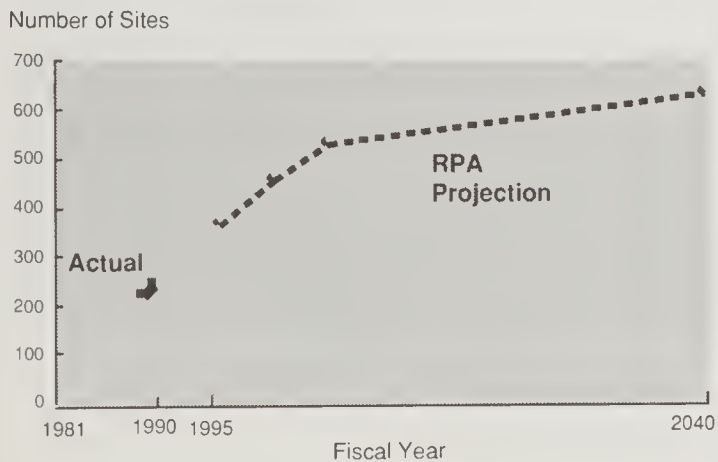
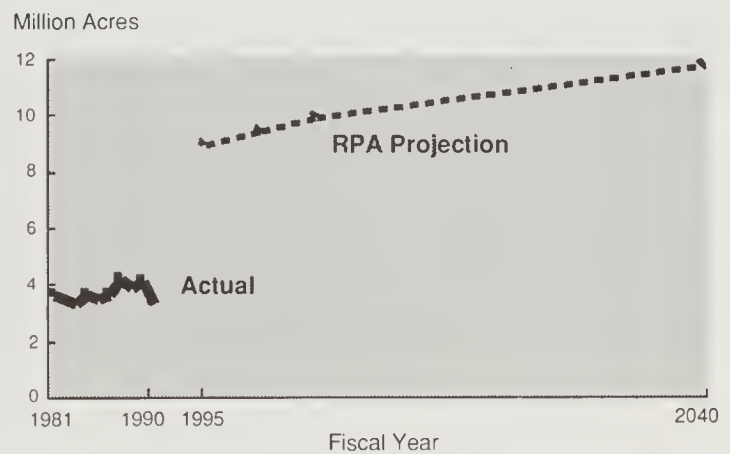


Figure 15.

State and Private Forestry Multiresource Plan



Report of the Forest Service

Improved scientific knowledge

By focusing research efforts on enhancing compatibility among competing resources, the Forest Service should be able to expand resource production opportunities while protecting the environment. Research will focus on three high-priority areas. First, knowledge of forest and rangeland ecosystems will be expanded. Research topics such as biological diversity, water quality, threatened and endangered species, global climate change, and tropical forestry will provide vital understanding of ecosystem interactions. Second, research about how people use and value natural resources will be expanded. Learning more about resource uses where wildlands and urban areas meet, rural development, and diversification of rural economies will enable the Forest Service to respond to people's changing values. Third, research cost allocation per research area will increase (figure 16). Finally, productivity and compatibility will be enhanced through improved scientific understanding of resource interactions. The effect of management systems and practices on resource productivity, potential, sustainability, and use will be emphasized.

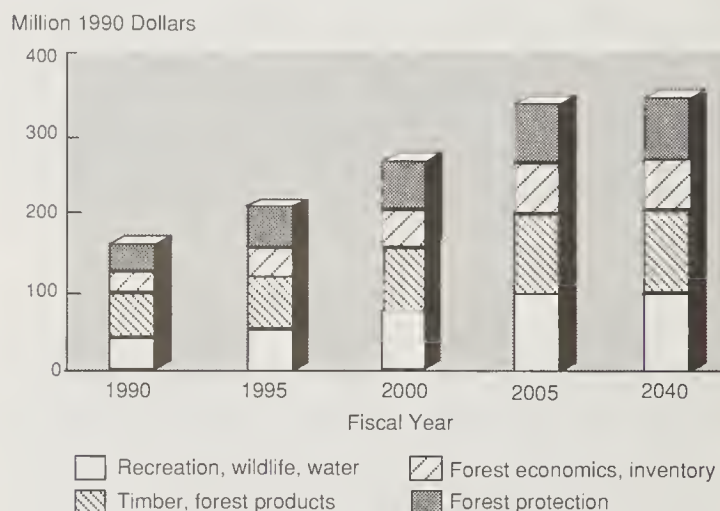
State and Private Forestry will emphasize transferring new technology and knowledge both within the Forest Service and to State and private partners.

Response to global resource issues

The Forest Service will expand efforts to exchange management technology internationally, especially technology related to tropical forests. Assistance will focus on helping other countries realize the potential of their resource bases, including environmentally acceptable commodity production. Expanded international scientific exchange will complement these efforts.

The President's America the Beautiful program, administered by State and Private Forestry, will stimulate tree planting on private lands. The program will help moderate carbon dioxide production that could contribute to global climate change and demonstrates U.S. commitment to worldwide sustainable forest management and reduction of atmospheric carbon dioxide buildup. Research efforts will improve understanding of basic ecological functions including the potential impacts of global climate change. For example, research will explore domestic forest management changes necessary to adapt to potential global climate change.

Figure 16.
Research Cost Allocations



Note: Research percent of total cost allocations per research areas listed in Program Goals table.



Agroforesters from the U.S. Micronesia and the Philippines exchanged knowledge during a workshop organized by the Forest Service's Institute of Pacific Island Forestry in Palau, Micronesia.

Photo by Susan Huke

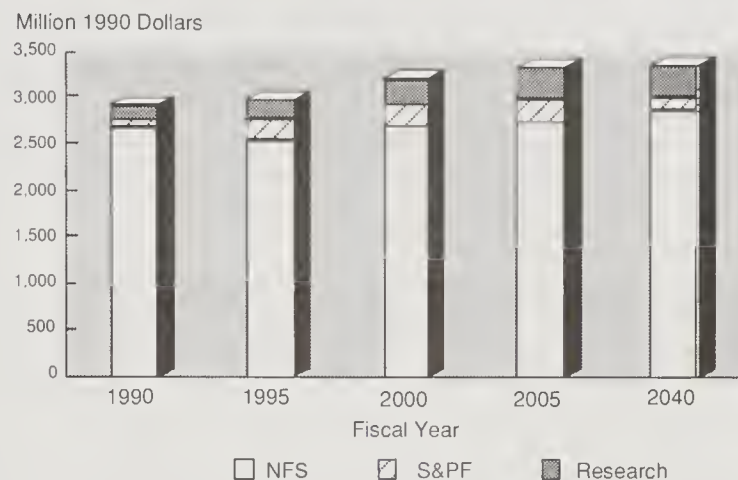
The Resources Planning Act Program and Assessment

Summary

The 1990 RPA Program charts the Forest Service's pathway into the 1990's and beyond into the 21st century. The program renews the Forest Service's commitment to multiple-use management and responds to public demand for environmental sensitivity and production of a diverse array of resources. Integrative approaches to natural resource research, program development, and management, combined with expanded partnerships with other public and private organizations, will be vital for successful implementation of the 1990 Program. Total program costs increase during the program's 50-year horizon (figure 17), but the Forest Service is committed to increasing the share of program costs financed by sources other than annual appropriations.

Figure 17.

Total USDA Forest Service Program Costs



Note: The 1990 RPA Program identifies program costs directly associated with NFS, S&PF, and Research activities. For 1990, costs are based on appropriations for those activities; e.g., all pest management costs are included in S&PF for 1990.



Improved scientific knowledge will help the Forest Service protect the long-term integrity, diversity, and productivity of ecosystems.

Photo by Robert Szaro



Photo by Dave Tippetts



NATIONAL FOREST SYSTEM

Multiple-Use Management— Changing Emphasis in Uses



INTRODUCTION

National Forest System lands are managed for many activities in many resource areas. Activities per various resource area are described in detail in this chapter. Table 1 displays a summary of 1990 National Forest System accomplishments compared to 1990 funded output levels and the last 5-year average. Table 2 displays a comparison of total 1990 funding levels with projected funding levels in the 1990 RPA Program for 1995. Table 3 displays National Forest System funding levels for 1986 through 1990. Table 4 displays a summary of 1990 National Forest System accomplishments compared with projected accomplishments in the 1990 RPA Program for 1995.

MULTIPLE-USE MANAGEMENT—CHANGING EMPHASIS IN USES

Introduction

Multiple-use management on the national forests is directed by the Multiple-Use Sustained-Yield Act of 1960 and the National Forest Management Act of 1976. The 1990 RPA Program renews the Forest Service's commitment to a balanced multiple-use management program within the context of increased environmental sensitivity.

In last year's Report of the Forest Service, in an attempt to better portray multiple-use management, we described how multiple-use practices were being implemented on selected management areas on three national forests. This year, we continue that effort, using examples from the Tonto National Forest in Arizona and the Ottawa National Forest in Michigan. In addition, a third example displays the creative planning occurring on the Shasta Costa Watershed on the Siskiyou National Forest. This planning effort exemplifies the fresh approach stemming from the New Perspectives initiative.

These examples illustrate how ecologically similar management areas, on the same forest, are managed differently depending on the uses and products to be produced. The forest plan for each forest identifies overall forest goals and objectives as well as specific goals and objectives for individual management areas. Ecologically similar management areas may have different goals and objectives, based on the multiple-use management needs identified in the forest plan.

For the Tonto and Ottawa National Forests, two ecologically similar management areas are described. The management area goals for each are identified, as well as the planned management practices, the standards and guidelines, and the expected outputs. Comparing the planned management practices, standards and guidelines, and expected outputs of two management areas on the same forest clearly illustrates how multiple-use management can have dramatically different results.

Tonto National Forest

The Tonto National Forest has almost 3 million acres of rugged, spectacular country in central Arizona, ranging from desert, studded with saguaro cactus, to pine-clad mountains beneath the Mogollon Rim. Although mining, logging, and ranching are important to the local economy, the variety of vegetation and the range in altitude from 1,300 to 8,000 feet offer outstanding recreational opportunities throughout the year.

Selected Multiple-Use Management Areas

The Roosevelt Lake and Apache Lake Recreation Areas are a single management unit of 65,566 acres. The management area consists of two reservoirs created for reclamation purposes and is located in the important Salt River watershed. Recently, the lakes have become popular for Phoenix and Tucson residents. Both cities lie within a 2-hour drive from the recreation areas. One route (the Apache Trail) is a national scenic byway.

Traditional uses include water-oriented recreation, livestock grazing, and wildlife habitat. Ecosystems are riparian, desert scrub, and river and lake channel. Presently, 17 recreation and public service sites total 334 acres. Approximately 54 percent of the areas are classified suitable for livestock grazing. One southern bald eagle territory, extremely vital to the threatened and endangered species recovery program, is located on the Tonto. The area is important for recovery efforts of the Gila top minnow and is the winter home for approximately 1,200 Canada geese. Prehistoric site density is among the highest in Arizona. The area borders the Tonto National Monument, which protects and interprets two well-preserved cliff dwellings.

The Salt River Canyon Wilderness, established in 1984, lies east of the Roosevelt Lake Recreation Area and contains approximately 32,100 acres of national forest. The Salt River and its spectacular canyon bisect the wilderness area for its entire length. Elevations range from 2,200 feet at the canyon's lower end to 4,200 feet on White Ledge Mountain. The area can be visited practically any time; however, there are no maintained trails. Travel through the wilderness is normally by raft or kayak during the spring runoff season.

Traditional uses of this area include river-running, hunting, fishing, and grazing. River-running on the Salt was featured in *Arizona Highways* and *River Runner* magazines, and the Salt is rapidly gaining the reputation as a premier Southwestern white-water run. The wilderness ecosystem comprises of riparian, desert scrub, and river channel with the chaparral/pinion-juniper forest. Currently, 78 percent is classified as suitable for livestock grazing. There are two southern bald eagle territories crucial to the recovery program on the Tonto National Forest. Peregrine falcon, razorback sucker, and Colorado River squawfish are other federally listed threatened and endangered species that are under inventory and study in the management unit.

Resource Management Goals

Roosevelt Lake and Apache Lake Recreation Areas. Forest plan goals for these areas are:

- Emphasize water-oriented developed and dispersed recreation.
- Enhance wildlife habitat and continue recovery of the southern bald eagle.
- Protect and interpret archaeological and historical resources.
- Manage the entire area to meet visual quality objectives.
- Manage wildfire consistent with resource objectives.

Salt River Canyon Wilderness. Forest plan goals for this area are:

- Preserve naturally occurring flora and fauna, aesthetic quality, and ecological processes.
- Provide a high-quality white-water river-running experience.
- Maintain or improve water quality.
- Manage wildfire consistent with resource objectives.



Salt River Canyon Wilderness, Tonto. F.S. Photo

Management Practices Planned

Roosevelt and Apache Lake Recreation Areas. The standards and guidelines for multiple-use management are:

- Develop two archaeological sites for interpretation this planning period, which ends October 1995.
- Develop 10 new and existing recreation sites in this planning period, providing capacity for 20,063 persons at one time.
- Develop one major visitor center this planning period.
- Improve and upgrade marina resorts on Roosevelt Lake and Apache Lake this planning period.
- Improve winter habitat for Canada geese.
- Manage habitat to enhance javelina, Gambel's quail, and cottontail rabbit.
- Rehabilitate southern bald eagle nesting habitat by planting large cottonwood poles on alluvial benches.
- Identify breeding home range of all peregrine falcons.
- Improve "unsatisfactory" range to "satisfactory" condition.
- Reconstruct major arterial roads for high concentrations of vehicles.
- Construct trail system to provide for a variety of user needs, resource protection, and public safety.
- Develop a river access point for river runners outside the wilderness this planning period.
- Use prescribed fire to treat heavy accumulations of fuels.
- Implement direction to restrict off-road vehicle travel to designated areas or travelways.

Salt River Canyon Wilderness. Standards and guidelines for multiple-use management are:

- Annually revise the Wilderness Implementation Schedule to ensure the maintenance of natural ecological processes.
- Continue to cooperate with other Federal and State agencies and Native American reservations to identify and protect or enhance habitat for bald eagles, peregrine falcon, Colorado River squawfish, razorback suckers, and bonytail chub.
- Refine and expand Limit of Acceptable Change monitoring program.

Report of the Forest Service

Figure 18. TONTO NATIONAL FOREST—OUTPUTS PRODUCED
Roosevelt and Apache Lake Recreation Areas and Salt River Canyon Wilderness. Planned area outputs displayed by resource category.

	Roosevelt and Apache Areas	Salt River Canyon Wilderness
Timber harvest (acres).....	0	0
Timber volume (MMBF).....	0	0
Old growth (acres).....	0	0
Lands unsuitable for timber management activities (acres).....	65,566	32,100
Wildlife habitat emphasized (acres).....	21,000	32,100
Wildlife habitat diversity (acres).....		
Pinyon-juniper.....	0	3,686
Desert scrub.....	39,471	26,746
Riparian.....	4,170	532
Lake or river channel.....	21,925	1,136
Species of wildlife and fish, threatened and endangered (estimated numbers)		
Bald eagles.....	2 nests, 30 wintering	2 nests
Peregrine falcon.....	1 nest	None known
Razorback sucker.....	0	Low population
Colorado River squawfish.....	0	Experimental/ nonessential population
Wildlife and fisheries habitat improvement projects.....	4.0	0
Road system (miles)		
Existing.....	126.8	0
Planned.....	3.0	0
To be closed.....	77.4	0
Recreation (visitor days)		
Developed.....	1,067,000	0
Dispersed.....	318,000	450
Facilities		
Recreation sites.....	17	0
Watercraft access points.....	10	3
Outfitter-guides		
Permits.....	18	9
Service days.....	9,950	2,400
Open road density (miles/square mile).....	.634	0
Activities (annual visitor days)		
Hunting.....	6,500	25
Fishing.....	153,400	100
Camping.....	695,000	100
Hiking.....	500,000	25
River rafting.....	0	200

- Implement total waste pack-out, campfire restoration, and daily boater entry restrictions for recreation use.
- Emphasize education and law enforcement programs.
- Develop partnerships that support "Leave No Trace" interpretive materials for river campers.

- Improve "unsatisfactory range" to "satisfactory".

Outputs for the Roosevelt Lake and Apache Lake Recreation Areas and the Salt River Wilderness Area are in figure 18.

Ottawa National Forest

The 954,000-acre Ottawa National Forest is located at the western end of Michigan's Upper Peninsula. This area is known for its rolling hills of hardwood forest, fishing, white-tailed deer, ruffed grouse and black bear hunting, rivers and waterfalls, spectacular fall colors, and plentiful winter snows. Even though the major midwestern cities of Detroit, Chicago, Minneapolis, and Milwaukee are within a day's drive, the Ottawa has a remote solitude that is unique and unexpected for the upper Great Lakes.

The Ottawa National Forest is continuing to develop and apply a land classification system that integrates soil, landform, vegetation, and riparian area resources. The Ecological Classification System was used in the forest plan development to determine management area boundaries and prescriptions.

Selected Multiple-Use Management Areas

The Baltimore and Gardner Management Areas were selected for comparative management description. Both are part of a glacial lakeplain, characterized by heavy clay soils. Elevation is about 1,100 feet, with little topographical relief except for frequent drainages. Aspen and balsam fir are the major tree species.

The Baltimore Area is 25,000 acres of aspen, balsam fir, and spruce woods, with smaller amounts of red maple and red oak. The Baltimore River bisects the area. U.S. Highway 45 provides north-south access, and an all-weather Forest Service road runs west to the area's center. The North Country National Scenic Trail meanders through the area. A major groomed snowmobile trail that runs from Wisconsin to the tip of Michi-

gan's Keweenaw Peninsula also crosses through. The area is heavily hunted. Logging occurs primarily in winter and occasionally during dry summers.

The 9,100-acre Gardner Area has more relief than the Baltimore Area. While aspen is the major tree species, there is more balsam fir as well as cedar, spruce, hemlock, and scattered clumps of old white pine. Drainages are more frequent and become steep close to the Ontonagon River's east branch. The North Country National Scenic Trail also transects this area. Recreational use consists mainly of hunting in the early part of the deer season. The area provides excellent winter-thermal cover and attracts large numbers of white-tailed deer. Logging occurs only during the winter.

Resource Management Goals

Baltimore Area. Forest plan goals for this area are:

- Maximize summer forage for white-tailed deer and ruffed grouse.
- Maximize production of aspen wood products.
- Emphasize natural regeneration of aspen.
- Maintain large number of temporary openings.

Gardner Area. Forest plan goals for this area are:

- Maintain or maximize winter-thermal cover for white-tailed deer.
- Maximize cuttings to benefit wildlife.
- Emphasize natural regeneration of conifers.
- Create small brushy openings.

Management Practices Applied

Baltimore Area. Standards and guidelines for multiple-use management are:

- Regenerate aspen to provide summer forage for white-tailed deer and ruffed grouse.
- Provide access for recreation-dispersed uses.
- Promote snowmobiling on the designated trail.
- Hiking on the North Country National Scenic Trail.
- Use interpretive signing to describe intensive forest management practices.
- Manage for aspen pulp and retain oak inclusions.



Baltimore Area sign explaining intensive aspen management.

Photo by Jim Jordan

Report of the Forest Service

Figure 19.

OTTAWA NATIONAL FOREST—OUTPUTS PRODUCED Baltimore and Gardner Areas. Planned area outputs displayed by resource category.

	Baltimore Area	Gardner Area
Planned timber harvest (next 10 years)		
Aspen regeneration (acres).....	3,550	1,900
Hardwood selection (acres).....	100	0
Volume to offer (MMBF).....	23.7	8.6
Old growth (acres)		
Managed for old-growth characteristics.....	0	74
Designated old growth.....	341	843
Lands identified as unsuitable for timber management activities (acres).....	3,400	878
Wildlife habitat emphasized (acres).....	3,550	1,900
Wildlife habitat diversity (% of area)		
Aspen/balsam fir.....	70-80	60-70
Hemlock/white pine/cedar.....	0	5-15
White spruce.....	1-5	5-15
Northern hardwoods.....	10-30	5-20
Planned wildlife habitat improvement projects		
Planting cedar and hemlocks for thermal cover replacement (acres).....	0	500
Scarification (site prep) for natural regeneration of conifers (acres).....	0	630
Create/develop upland openings (acres).....	39	0
Forage seed closed roads (miles).....	23	0
Trails (miles)		
Hiking (North Country Scenic Trail).....	8	4
Snowmobile (groomed).....	6	0
Road system—existing and planned (miles)	83.4	60.7
Closed to vehicle use (%) via gate/berm.....	82	25
Existing roads to be obliterated (miles).....	0	12.2
Recreation (recreation visitor days)		
Deer hunting.....	2,100	500
Grouse hunting.....	300	100
Snowmobiling.....	350	10
Hiking.....	250	50
Total recreation use.....	3,000	660

Gardner Area. Standards and guidelines for multiple-use management are:

- Maintain evergreen winter-thermal cover for deer, along with remote habitat for fisher, marten, black bear, and other animals.

- Promote dispersed recreation, such as hunting and hiking, on the North Country National Scenic Trail.

- Use timber harvest to meet wildlife habitat objectives; use shelterwood to increase conifers for winter-thermal cover.

Outputs for the Baltimore and Gardner Areas are in figure 19.



Shasta Costa Overlook, Siskiyou National Forest. F.S. Photo

Siskiyou National Forest

The Siskiyou National Forest lies in southwest Oregon and northwest California. The terrain is steep and rugged, with elevations ranging from 100 to more than 7,000 feet. The geological variety and a wide difference in amount of precipitation across the forest yield an unusual diversity in vegetation and an associated richness in wildlife species. The area is one of the most diverse ecosystems in the world.

Recreation and tourism play a significant role in the economy of southwest Oregon; the Siskiyou National Forest is a key to these industries. In addition, the forest contributes significantly to the production of sawtimber and other wood products, and hence also to the local economy.

The Siskiyou National Forest Plan was completed in 1989. The complex resource interrelationships and values on the Shasta Costa watershed led to the preparation of an integrated resource analysis of the area before making project decisions tiered to the forest plan. A primary objective was to most efficiently achieve the desired future condition in the forest plan. New Perspectives thinking was applied within the context of the forest plan.

Selected Multiple-Use Management Area

Shasta Costa is a 23,419-acre watershed approximately 30 miles east of the Pacific coast. While the extreme east and west ends of the football-shaped basin have had intensive harvesting in the past, the interior 14,000 acres remain unroaded. Most

of the area is covered by mixed evergreen forest. Douglas-fir is the predominant conifer, while tanoak, madrone, and canyon live oak are important hardwoods. Black-tailed deer, elk and black bear roam the area, while Shasta Costa Creek provides important habitat for Chinook salmon, steelhead, and cutthroat trout.

The Siskiyou National Forest Plan lists 24 general goals for the forest. Several of these goals specifically address the maintenance of a healthy forest ecosystem, viable populations of existing native plant and animal species, and the health and function of riparian ecosystems. In addition, the goals provide for biological diversity and long-term productivity by maintaining ecosystem functions and by minimizing adverse impacts to the soil resource.

Resource Management Goals

Shasta Costa Area. Forest plan goals for this area are:

- Maintain wilderness character in its natural condition and provide opportunities for solitude and recreation.
- Provide exhibits of plants, plant groups, and communities with exceptional botanical and ecological value.
- Provide quality fish habitat, water, wildlife habitat, and recreation opportunities in a largely undeveloped setting.
- Provide mature and old-growth habitat for dependent wildlife species.

Report of the Forest Service

- Provide an array of unique plant and animal conditions that contribute to overall wildlife habitat diversity.
- Provide river-oriented recreation in an area of high-quality scenery and largely undeveloped shoreline of scenic and recreation segments of the river corridor.
- Protect intrinsic values of ecosystems bordering bodies of water and wetlands while providing limited multiple-use development opportunities.
- Protect scenic values while providing multiple-use development opportunities that are not visually evident to the casual forest visitor.
- Protect scenic values while providing multiple-use development opportunities that are visually subordinate to the landscape.
- Provide multiple-use development opportunities and a high yield of timber, subject to multiple-use constraints.
- Diversify silvicultural approaches; reduce emphasis on clearcuts.
- Use existing roads wherever possible.
- Minimize the fragmentation of continuous forest; create a web of connected habitats. Leave broad travel connectors for plants and animals, especially along streams and ridges.
- Select what is left behind as carefully as what is taken out—specifically, standing live and dead trees and fallen logs.
- Leave a mixture of tree sizes and species on the site; restore naturally diverse forests after harvest.
- Use the latest studies and state-of-the-art technology to design, monitor, and evaluate new approaches.
- Use only the scientific findings that make sense for the region and social setting.
- Monitor to ensure conserving biological diversity.

Working within the forest plan, the Shasta Costa interdisciplinary team applied New Perspectives thinking in analysis and recommendations while maintaining stability of the forest and the human communities that depend on it. The team defined New Perspectives in three segments. First, “New Thinking” emphasizes the maintenance of functioning ecosystems, leaves resources biologically resilient to change, and views each resource from stand, watershed, and landscape perspectives, within the framework of the forest plan. Second, “New Technologies” involves both old and new silvicultural prescriptions based on technical developments and scientific findings designed to meet integrated resource objectives and goals for each management area. “New Technologies” also maintains an ongoing partnership with agency and university researchers. Finally, “New Alliances” maintains constant communication with people directly affected by management decisions, political representatives, Forest Service and other agency employees, and other interested parties.

Management Practices Applied

Shasta Costa. Standards and guidelines for multiple-use management are:

- Mimic natural disturbance patterns and recovery strategies in the areas.
- Manage for landscape diversity as well as within-stand diversity.
- Maintain a diverse mix of genes, species, biological communities, and regional ecosystems.
- Prioritize in favor of the species, communities, or processes that are endangered or otherwise warrant special attention.

The forest has prepared a Draft Environmental Impact Statement (DEIS) to analyze alternative ways of reaching the forest goals for the Shasta Costa Management Area. The Preferred Alternative in the Shasta Costa DEIS focuses on maintaining biological diversity while producing a moderate level of commodity and noncommodity products. Using New Perspectives techniques, the Preferred Alternative would leave biological legacies, retain biological habitat connections for plant and animal species, and increase the old-growth component of the basin by deemphasizing clearcutting, leaving most old growth in the basin while harvesting in mature and immature stands.

Figure 20 compares the outputs of two alternatives. The first, identified as the “Preferred Alternative,” is in the DEIS. The second, “Alternative B,” is one of five alternatives evaluated in the DEIS. Although all alternatives meet forest plan standards and guidelines, “Alternative B” most closely reflects the Siskiyou’s capital investments and 10-year action plan in the forest plan.

LAND MANAGEMENT PLANNING

The Planning Process

The National Forest Management Act of 1976 (NFMA) directed the Secretary of Agriculture to develop a land and resource management plan for each administrative unit of the National Forest System. Regulations that guide this effort require integrated planning for all resources (that is, recreation, fish and wildlife habitat, water, timber, range, and wilderness).

Land management planning is a continuing process; it addresses the changing resource demands made on the supply of renewable resources and minerals. The Forest Service, with public input, updates and amends forest plans as needed to

Figure 20.

SISKIYOU NATIONAL FOREST—OUTPUTS PRODUCED
Shasta Costa. Planned area outputs displayed by resource category.

	DEIS	
	Preferred Alternative	Alternative "B"
Planned timber harvest		
Regeneration (acres).....	223	518
Group selection (acres).....	38	54
Commercial thinning (acres).....	430	202
Employment (number).....	183	285
Payment to County (dollars).....	960,000	2,260,000
Volume to offer (MMBF).....	11.2	17.5
Old growth (acres).....	7,990	7,830
Lands unsuitable for timber management.....	1,785	1,785
Wildlife habitat emphasized.....	4,473	4,473
Wildlife habitat diversity		
Douglas-fir association (acres).....	7,273	7,273
Tanoak association (acres).....	12,476	12,476
True fir (acres).....	3,670	3,670
Wildlife and fish species		
Northern spotted owls.....	10	10
Elk.....	40	40
Spawning chinook salmon.....	262	262
Spawning coho salmon.....	28	28
Spawning steelhead.....	140	140
Spawning cutthroat trout.....	40	40
Wildlife and fisheries improvement		
Retain habitat connections (%).....	100	54
Constructed fish structures (number).....	20	20
Meadow enhancement (acres).....	405	274
Maintain summer stream temperature below 67.3 degrees Fahrenheit (% of time).....	100	99
Road system		
Existing (miles).....	55.0	55.0
Closed to motor vehicle use (miles).....	16.9	12.1
New construction (miles).....	2.5	6.2
Recreation		
Visitor days (number).....	100,000	100,000
New trail construction (miles).....	10.5	7.4

ensure that adequate resources will be available for future generations.

The Forest Service uses forest plans to provide the Administration and Congress with accurate program and budget information and to guide program implementation on the ground for each national forest. However, the appropriation process adjusts the planned outputs on an annual basis—from the plan

level to one reflecting current economic conditions and realistic demand and use expectations. The achievement of outputs projected by a forest plan is determined by the rate at which a plan is implemented, based on appropriations approved by the Congress. If at any time the objectives of a forest plan become unachievable, it will be necessary to amend that plan.

Regional Guides

All nine regional offices have published final regional guides and environmental impact statements required by the NFMA planning regulations. The guides address primary issues and management concerns of the regions and provide tentative resource objectives as recommended by the 1990 RPA Program for each national forest within each region.

Although the guides ensure that a consistent approach to national forest planning is followed throughout each region, they offer the managers of each forest considerable latitude in formulating their individual forest plans. The guides also help coordinate National Forest System programs with the Forest Service State and Private Forestry and Research programs.

The Rocky Mountain Region began to revise its regional guide in 1990. A draft was released in early 1991.

Status of Forest Plans

Under NFMA, 123 forest plans are being developed. The Washington Office has reviewed drafts of all plans, except the Klamath National Forest plan. The Tongass National Forest plan, finalized in 1979, is being revised; a draft revision was issued in June 1990. During 1990, 18 forest plans were finalized (1 in the Pacific Southwest Region, 15 in the Pacific Northwest Region, and 2 in the Intermountain Region), bringing the total of plans finalized to 114. Plans of seven California forests are still in draft (table 5).

Figure 21 lists the draft and final forest plans and environmental impact statements prepared to date.

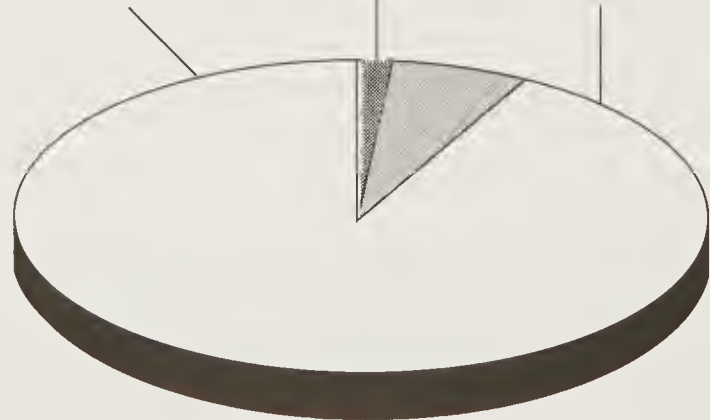
Figure 21.

Status of Forest Plans

114 Final Forest Plans Released

1 Remaining Plan to be Released in Draft

8 Forest Plans in Draft



Implementation and Monitoring of Forest Plans

Monitoring and evaluation of completed forest plans are required by the NFMA and planning regulations. Monitoring and evaluation are used to (1) determine whether the forest plan is being followed, (2) determine whether resource objectives are being met, and (3) evaluate whether the assumptions and models used in the development of forest plans were valid.

We are seeking the views of the public on whether the plans are working on the ground. The plans are being amended as changes are needed. In 1990, 110 amendments were made to forest plans on 49 national forests.

Status of Forest Plan Appeals

The administrative appeals process allows persons outside the agency to review forest plan decisions and to object to decisions at higher Forest Service organizational levels. The process ensures that objections are reviewed fairly. Since the first forest plans were finalized in 1979, more than 1,000 appeals have been filed, with approximately 675 resolved. Approximately 145 forest plan appeals were resolved in 1990. Also, in 1990, 62 forest plans were cleared of all appeals.

Wilderness Legislation

At the end of 1990, there were approximately 33.3 million acres of wilderness in the National Forest System, with an increase of approximately 733,400 acres in Nevada and an additional 12,000 acres in Maine (table 40).

During the second session of the 101st Congress, members introduced 13 wilderness designation bills involving 6 States—Alaska (1), Colorado (3), Illinois (2), Maine (2), Montana (3), and North Carolina (2). Subsequent to September 30, 1990, bills for Alaska and Illinois were enacted, and a bill for West Virginia proposing a boundary adjustment to the existing Cranberry Wilderness was proposed. Hearings were held in the Senate and House on the bill for North Carolina, which passed the House but not the Senate. No subcommittee hearings were held on the Colorado or Montana bills.

Results of the Land Management Planning Critique

After 10 years of developing comprehensive plans for each national forest, the Chief of the Forest Service commissioned a yearlong evaluation of planning accomplishments. This 11-volume "critique" of forest planning was completed in 1990. Critique findings were developed by Forest Service employees, the Conservation Foundation, Purdue University, the University of California at Berkeley, the USDA Office of the General Counsel, and a representative of the Bureau of Land Management. The findings were based on contributions of more than 3,500 individuals and interest groups, Federal, State, and local governments, and Indian tribes who participated in workshops or submitted comments on Forest Service planning efforts.

Volume 1 of the critique is a synopsis. The other 10 volumes cover searching for a common vision in planning; organization and administration; analytical tools and information; public participation; effectiveness of planning coordination; effectiveness of decisionmaking; plan usefulness; analysis of timber supply disruption; compliance with implementation of NFMA, NEPA, and other laws; and what needs fixing. The various critique activities resulted in more than 230 recommendations that were comprehensively summarized into the following seven summary recommendations:

- Simplify, clarify, and shorten the planning process.
- Ensure high-quality planning.
- Improve the organizational and administrative infrastructure for planning.
- Strengthen and clarify the ties between forest plans and programming, budgeting, and appropriation activities.
- Define, clarify, and explain the RPA, NFMA, and NEPA processes, and explain how they fit into the agency's framework for multilevel planning, decisionmaking, and management.
- Develop a comprehensive strategy, and clearly assign responsibilities for implementation and maintenance of forest plans.
- Refurbish the mechanisms for quality control, management review, and forest plan monitoring.

The critique's findings and recommendations are now being reviewed. Many of the critique's findings will aid in the upcoming revision of the NFMA regulations and in other forest planning activities.

Review of the NFMA Regulations

In 1990, the Forest Service initiated a review of the existing regulations governing land and resource management planning on the National Forest System. The review is based on the critique of land management planning, the agency's experience under the current regulations, and decisions from forest plan appeals and litigation. Upon completion of this review, revised regulations will be issued in draft for public review.

MINERALS

The Forest Service manages a variety of energy and mineral resources that have critical and strategic importance to the Nation's economy and security. Industry plans to explore and develop these resources are evaluated and operations are monitored and administered to ensure compliance with laws and regulations. The Forest Service also ensures that lands disturbed by mineral and energy activities are reclaimed for other productive uses.

During 1990, the Forest Service processed 25,927 leasable, locatable, and salable mineral cases (operations)—104 percent of the funded target level (table 6). The 1990 RPA Program projects a 46-percent increase (base year 1990) in operations by 1995, with operation activities projected to remain constant after 1995 to the year 2040. Mineral operations include the processing of lease applications, prospecting permits, validity examination, operating plans, geophysical permits, and surface use permits for the mining of private mineral estates.

Valuable energy resources, including oil, gas, coal, and steam from geothermal sources, are extracted from lands under leases held by private operators. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 authorizes the Secretary of Agriculture to develop procedures and regulations governing leasing for oil and gas resources, including bonding and reclamation requirements, within the National Forest System. This authority was formerly exercised by the Bureau of Land Management. Regulations governing the implementation of these new authorities were issued March 21, 1990.



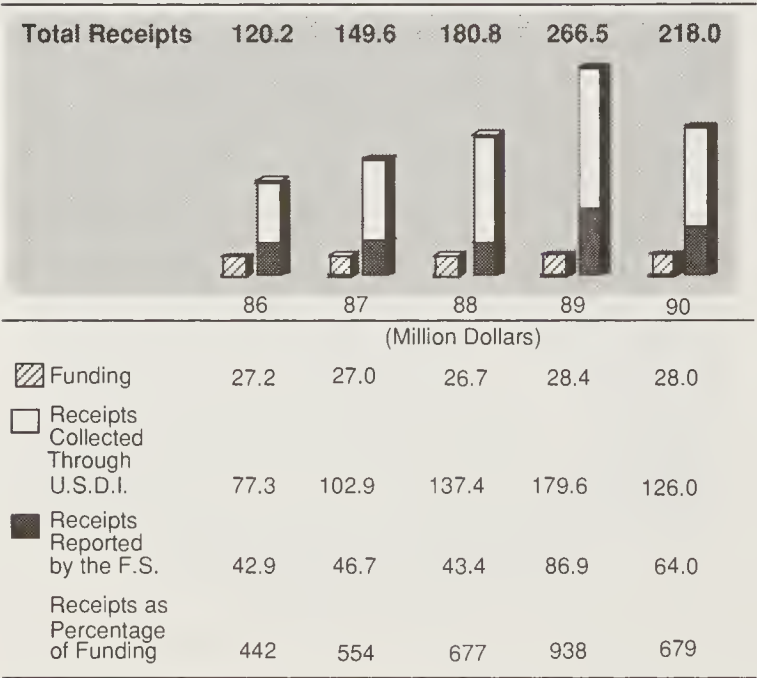
This drilling site on the Cabinet Mountain Wilderness on the Kootenai National Forest in Montana was explored for deposits of silver and copper. F.S. Photo



Exploration wells, known as "wildcats," are used to discover new sources of oil and gas. Like most wildcats, this well on the Helena National Forest in Montana failed to make a discovery. This site has since been reclaimed. Photo by Steve Marshall

In 1990, 12 million acres were under lease for oil, gas, coal, and geothermal activity—a decrease of 14 percent from 1989 and 65 percent from 1983 (table 7). The decline in acres under lease resulted from reduced activity in the industry caused by a stagnant world energy market and from delays in issuing leases caused by appeals, especially in the Northern, Rocky Mountain, and Intermountain Regions. The appeals charged that environmental and planning analyses were incomplete.

Figure 22.
Minerals—Funding and Receipts



The issuance of new oil and gas regulations provided direction for completing the environmental and planning analyses necessary to restore the Forest Service leasing programs. The 1990 RPA Program projects a 33-percent increase (base year 1990) in leased acres by 1995, with leased acres projected to remain constant from 1995 to 2040.

Receipts from rents, royalties, sales, and bonus bids for minerals were \$190 million in 1990 (figure 22). Receipts from mineral production are generated by bonus bids, royalties, and rentals. Most of the mineral revenues received are generated by leases issued in prior years.

The Forest Service also regulates activities authorized by the 1872 Mining Law (locatable minerals such as gold, silver copper, platinum, and so forth). In 1990, there were more than 7,000 active hard-rock mining sites. Approximately 3,400 were covered by Notices of Intent to operate for minor activity and 3,600 under Plans of Operations for significant surface disturbance activities. Approximately 1,200 were producing mines.



Forest Service hosts describe the geologic processes of a volcanic eruption to visitors at the Mount St. Helens National Volcanic Monument. Photo By Jill Bauermeister

The Forest Service manages more than 1,000 pits and quarries, which produce mineral materials that include common varieties of sand, stone, gravel, cinders, clay, pumice, and pumicite that are sold, granted free to qualified users, or used to build or maintain Forest Service roads or other facilities.

The Forest Service worked closely with the minerals industry to showcase mineral operations that demonstrate sound environmental practices. Several companies participated in the development of oil and gas field showcases on the Wasatch-Cache

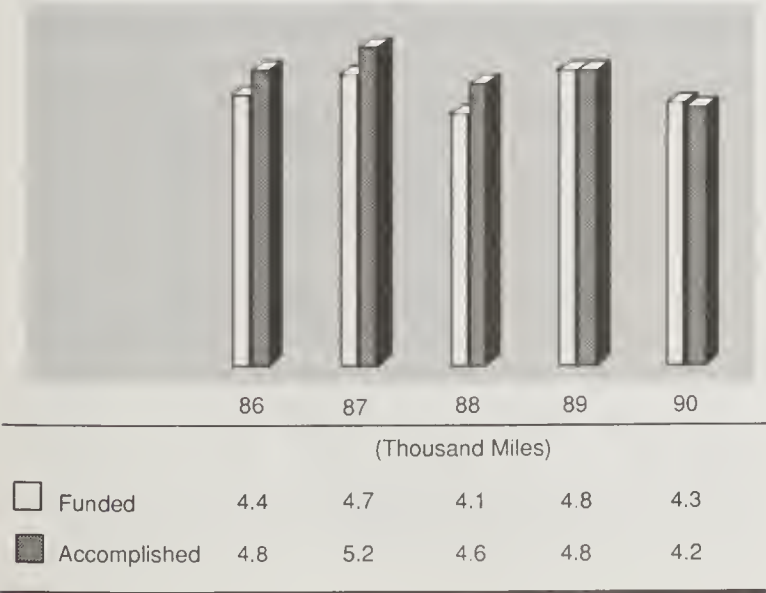
and Carson National Forests. A hard-rock mining showcase on the Humboldt National Forest was developed with the Independence Mining Company. Other mineral operations receiving special recognition for environmental stewardship were the Beal Mine, operated by Pegasus Gold, Inc., on the Deerlodge National Forest and on the Mineral Hill Mine, a joint partnership owned by American Copper and Nickel and Homestake, Inc. on the Gallatin National Forest. Another Forest Service partnership in 1990 involved the funding of a forest exhibit for the National Mining Hall of Fame Museum in Leadville, CO. The exhibit, including a touch screen video system, is one of the largest in the museum.

LANDS

The activities under this program protect and conserve key resource values; provide an identifiable, accessible, and more manageable public land base; provide accurate land status and title information; respond to public and private land use applications; and protect the public's interest in the 191 million acre National Forest System (table 8).

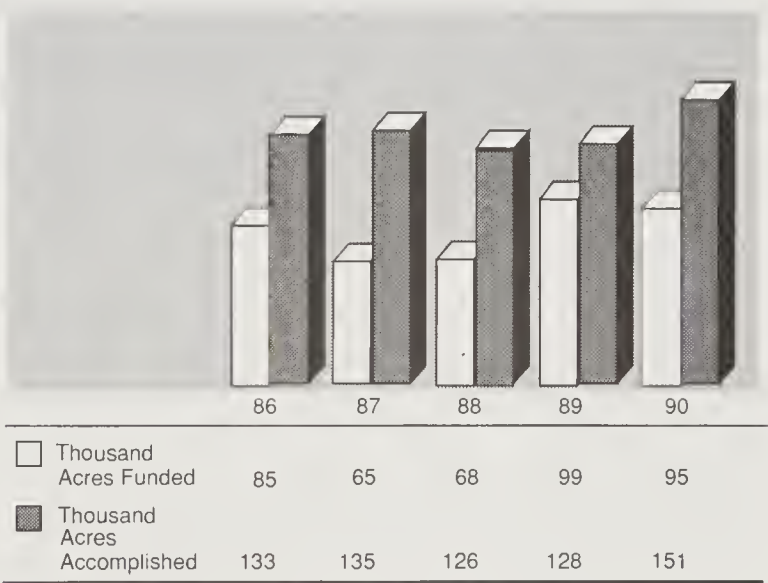
The accurate location of landlines—the legal boundaries between National Forest System lands and other ownerships—is essential for managing these lands, protecting them from encroachment, and providing their resources for public use while protecting adjacent non-Federal lands. In 1990, the Forest Service appropriated \$28.9 million to locate a total of 4,215 miles of property boundaries—98 percent of the funded target of 4,293 miles (figure 23). At the end of 1990, 98,992 miles or 36 percent of the 272,409 miles of National Forest System property boundaries were properly established (table 9).

Figure 23.
Landline Location Accomplishments



In 1990, the Forest Service exchanged 110,820 acres of National Forest System land for 150,994 acres of non-Federal land (figure 24, table 10). Much of the non-Federal land acquired through land exchanges is within classified wilderness areas, national recreation areas, wild and scenic rivers, national trails, and other congressionally designated areas. The acquired lands included thousands of acres of critical wildlife habitat, wetland, and riparian areas. In addition, national forest property lines were reduced by 1,273 miles, saving approximately \$7.1 million in future landline location costs—about 1.1 times the \$6.1 million cost of the exchanges. Additional future savings will accrue from fewer trespass and rights-of-way cases and special use permits.

Figure 24.
Land Exchange Accomplishments



A total of 135 cases were resolved under the 1983 Small Tracts Act, involving the sale or exchange of 1,883 acres of National Forest System land. In return, the United States received 1,327 acres of land and \$1,665,561. These cases included unmanageable parcels of various sizes and shapes located between mineral patents, small parcels innocently occupied, and road rights-of-way no longer needed. Since February 1984, following implementation of the Small Tracts Act, 1,163 cases, most involving encroachment, have been resolved.

The Forest Service purchased 81,452 acres of land and interests in land with money from the Land and Water Conservation Fund, receipts acts, and other appropriations. Landowners donated 642 acres of land and interests in land to the National Forest System. These lands help protect wetlands and riparian areas, wild and scenic rivers, national recreation areas, national trails, wilderness areas, natural areas, critical habitat for wildlife, fish and plant species, and other special areas.



The recently acquired Grand Island National Recreation Area in Lake Superior. Photo by Loren Woerpel

The Forest Service acquired more than 360 miles of road rights-of-way, including 303 miles of existing roads, through 523 cases, to improve or protect access to the National Forest System for all users (figures 25 and 26).

The administration of 65,000 nonrecreation and recreation special uses returned approximately \$27.5 million in rental

fees. Nonrecreation uses accounted for 20 percent of the returns. Special uses include electronic sites, recreation residences, ski areas, resorts, private roads, power transmission lines, and various types of pipelines. Forest Service administration ensures the protection of public health, safety, and environmental values as well as fairness and equity for the users and the public.

Figure 25.

Miles of Rights-of-Way Acquired

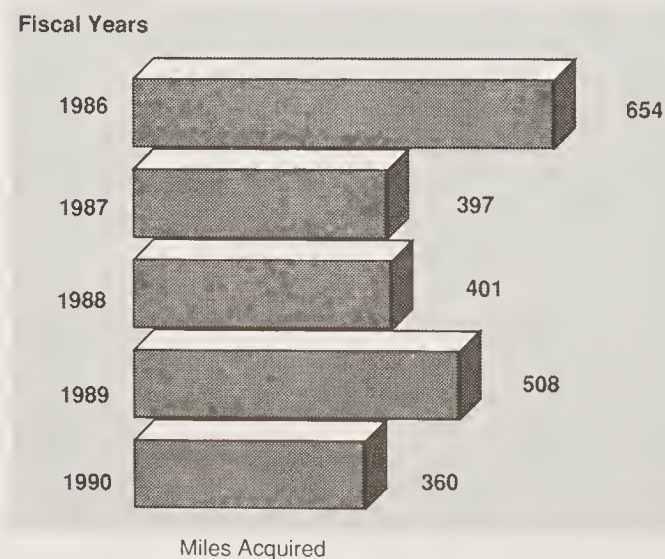
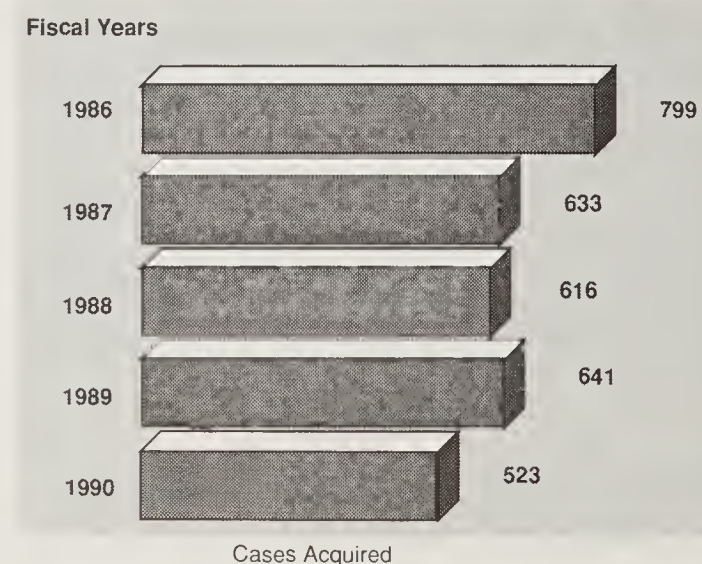


Figure 26.

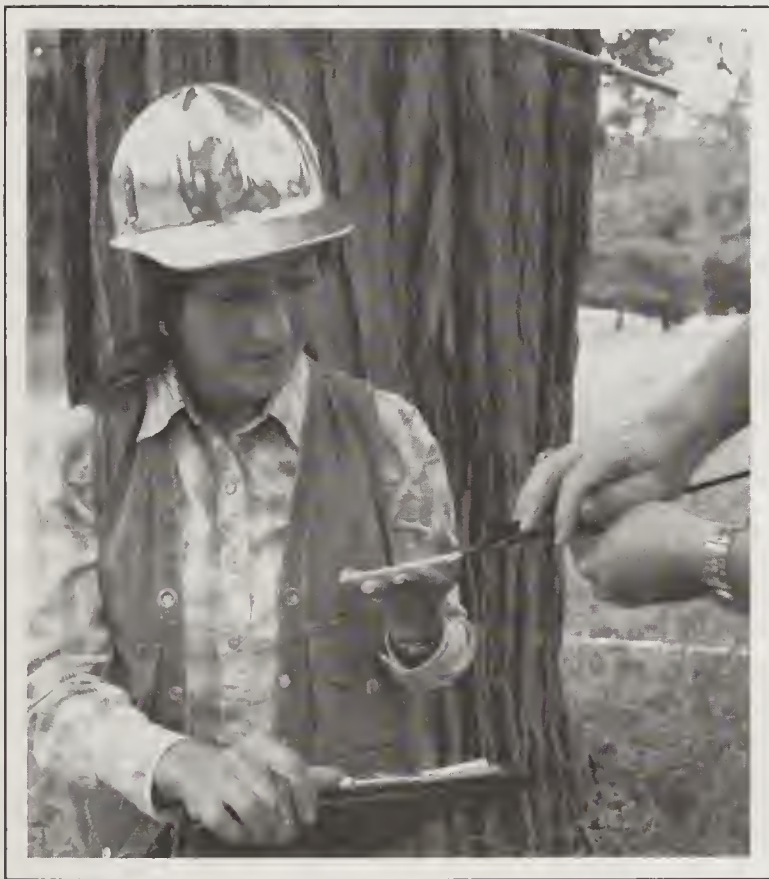
Rights-of-Way Acquisitions



FOREST MANAGEMENT

Silvicultural Examinations

In 1990, the Forest Service completed silvicultural examinations on 5.9 million acres. These examinations provide data on existing ecological habitat, tree stand conditions (age, size, health, and vigor), and capabilities, growth, and mortality trends on a given site. Data from examinations are used to develop site-specific, integrated resource prescriptions to meet national forest plan objectives.

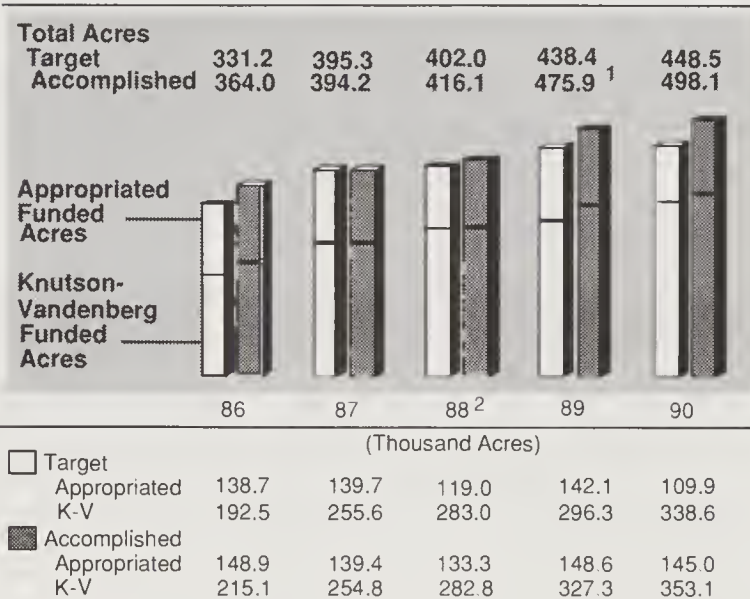


A timber technician on the Angeles National Forest examines an increment core to determine age and growth. Photo by Roy Murphy

Reforestation

In 1990, the Forest Service reforested 498,000 acres (figure 27, table 12), with over 50 different species of trees. Appropriated, Reforestation Trust, and carryover funds reforested 145,000 acres, while the Knutson-Vandenberg Act funds reforested 353,000 acres. Natural regeneration occurred on 59,000 acres and is included in the above numbers.

Figure 27.
Reforestation



¹ An additional 16,350 acres were accomplished with contributed funds and were included in table 13.

² Does not include 36,800 acres of natural regeneration without site preparation.

Over the last 5 years, an average of 90 percent of all reforestation has successfully met stocking objectives. In 1989 (the latest year for which data are available), the reforestation success rate was 91 percent. Understocked plantations will be replanted to ensure adequate stocking levels. The currently understocked acres on the national forests needing reforestation total 1,144,000 acres, a decrease of 80,000 acres (tables 13 and 14) from 1989. Tables 15 and 16 display reforestation acres, by States and regions respectively, certified as being satisfactorily stocked. The 1990 RPA Program projects a 16-percent decrease (base year 1990) in reforestation by 1995, with reforestation projected to rise slightly between 1995 and 2040 but remain at less than 1990 levels.

Tree Nursery Operations

Ten Forest Service nurseries produced 132.2 million seedlings—127.7 million bareroot and 4.5 million container seedlings for reforestation. The seedling production costs are charged to the working capital fund, which is, in turn, repaid as a cost of seedlings by the reforestation program for the individual national forests. Two nurseries were closed in 1990 to improve the overall efficiency of our nursery operations. Contracts with State and private nurseries supplied the Forest Service with an additional 36.1 million seedlings.

To improve forest tree growth characteristics and disease resistance, the Forest Service maintains a tree improvement program. Seeds are collected from selected national forest trees that have natural superior growth or disease resistance and from tree seed orchards that produce genetically superior seedlings for outplanting on the national forests.

Report of the Forest Service

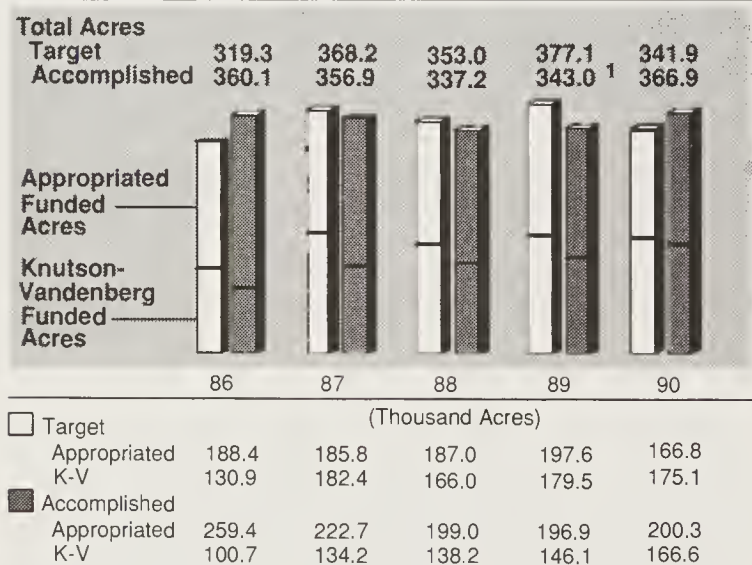
Timber yields may be increased by 10 percent on national forests reforested with genetically improved planting stock. The 7,798 pounds of seed harvested from seed orchards in 1990 was 17 percent of the total seed collected by the Forest Service. During 1990, 19 percent of the acres planted on the national forests were planted with seedlings grown from seeds obtained from seed orchards.

Timber Stand Improvement

Timber stand improvement treatments were applied to a total of 366,900 acres (figure 28, table 17). Appropriated and carryover funds were used for treating 200,300 acres, and Knutson-Vanderberg Act funds treated 166,600 acres. The 1990 RPA Program projects a 12-percent decrease (base year 1990) in timber stand improvement by 1995, with treatment acres projected to initially rise slightly after 1995, still below 1990 levels, and then gradually decrease toward 2040.

Table 19 provides detailed information on timber stand improvement acre needs and table 18 summarizes the data. Tables 15 and 16 display timber stand improvement acres, by States and regions respectively, certified as being satisfactorily stocked.

Figure 28.
Timber Stand Improvement

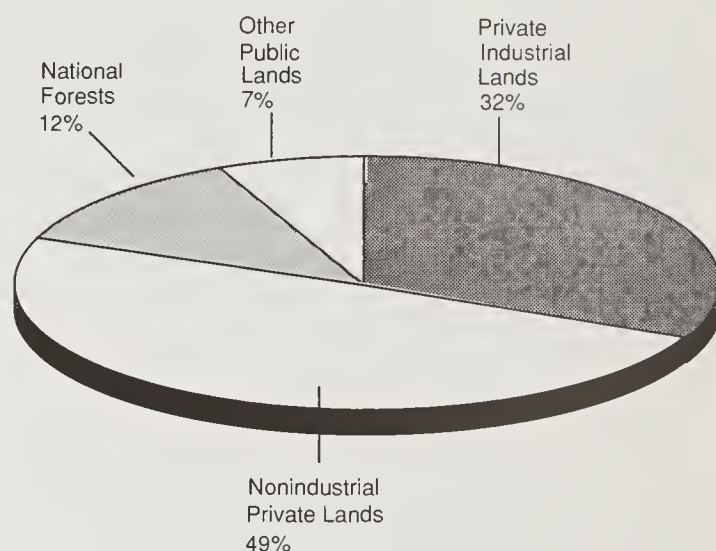


¹ An additional 3,278 acres were accomplished with contributed funds and were included in table 18.

Timber Sale Preparation, Offering, and Harvest

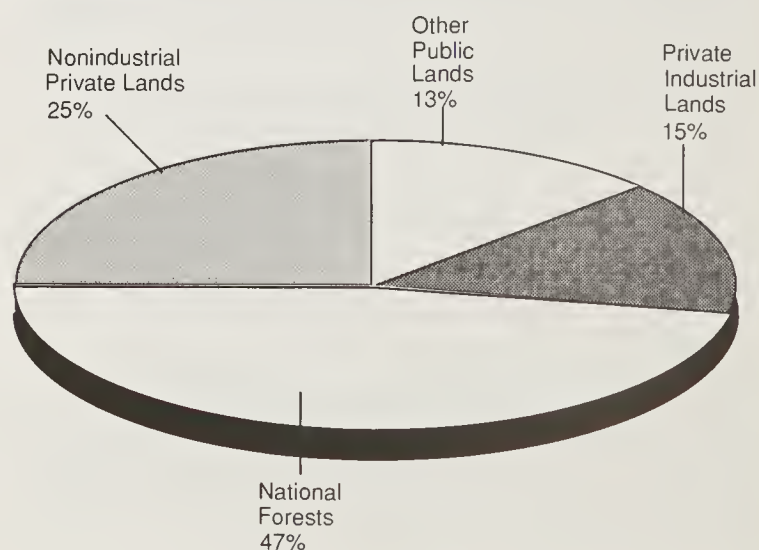
The national forests provide 12 percent of the total wood volume harvested annually in the United States. This compares with 49 percent from nonindustrial private forest lands,

Figure 29.
Percentage of Total Annual Wood Harvested from Lands in the United States



32 percent from lands owned by industry, and 7 percent from other public lands (figure 29). However, of the Nation's softwood sawtimber volume used for lumber and plywood, national forests contribute approximately 25 percent (figure 30).

Figure 30.
Inventory of Standing Softwood Sawtimber Percent by Ownership

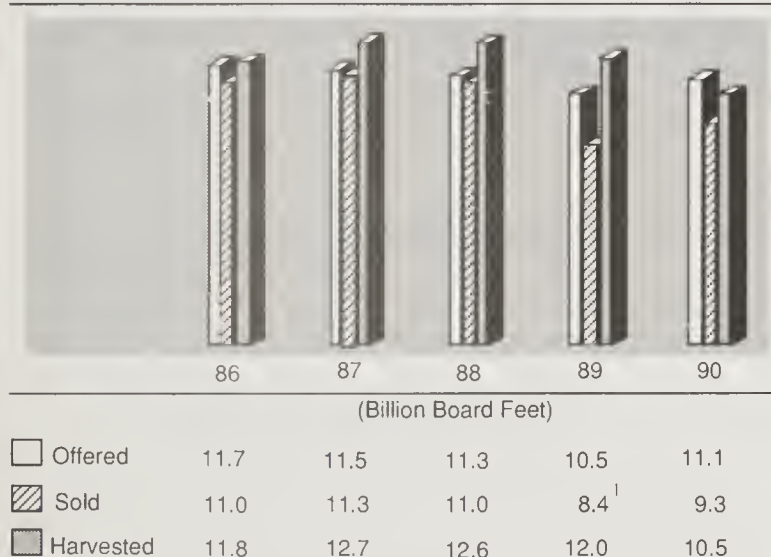


In 1990, the national forests sold 9.3 billion board feet (BBF), which is 83 percent of the funded target for timber offered for sale (figure 31). Sell volume includes green timber, salvage timber, and firewood. Figure 32 displays, by region, timber offered and sold, timber harvested and under contract. Table 21 provides information, by region, of timber offered, sold, unsold, and harvested, and table 20 summarizes the data. Table 22 displays timber sold and offered by each State for 1990. Table 23 displays number of sales, volume, and value of timber sold by size class for 1990. Table 24 displays, by region, uncut timber volume under contract. The 1990 RPA Program projects a 3-percent decrease (base year 1990) in timber offered by 1995, with offer levels projected to rise 8 percent between 1995 and 2040.



A crew discusses project plans for timber sales on the George Washington National Forest in Virginia. Photo by Yuen-Gi Yee

Figure 31.
Timber Offered, Sold, and Harvested



¹ Appeals, litigations, and Spotted Owl Temporary Restraining Order delayed the offer and award of 1.6 BBF of new sales in Region 6 and 0.2 BBF in Region 5.

The Forest Service's timber sale revenues continue to exceed program costs. In 1990, timber sale costs, including roads, were \$745.8 million; timber harvest revenues were \$1.175 billion (table 25).

The Forest Service dramatically reduced the use of clearcuts as a regeneration technique. We are shifting to other even-age methods that have fewer aesthetic impacts (because selected mature trees are left on the site) and are using uneven-age harvest and regeneration methods where they are appropriate. Clearcuts decreased 27 percent from 1989 to 1990. Clearcuts are decreasing dramatically from recent historic levels following projected 1990 RPA Program trends.

Section 318 of the 1990 Department of Interior and Related Agencies Appropriation Act directed national forests in the Pacific Northwest Region to sell a total of 7.7 billion board feet (BBF) during 1989 and 1990. It also directed that 1.1 BBF of that amount come from timber sales under injunction in the Seattle Audubon Society lawsuit. The 1.1-BBF requirement was met. Section 318 required that citizen advisory boards review 1990 timber sales on the 13 national forests with spotted owls; this was fulfilled by the end of May 1990. The advisory boards, representing diverse interests, made recommendations on every timber sale.

As of October 1, 1990, timber sale volume offered was 7.3 BBF, 0.4 BBF short of the section 318 target (7.7 BBF); 6.3 BBF was actually awarded and the remaining 1.02 BBF is awaiting award. The shortfall was induced by a variety of factors including recommendations by the advisory board, conferences and consultations with the U.S. Fish and Wildlife Service, and administrative appeals or litigation regarding specific timber sales.

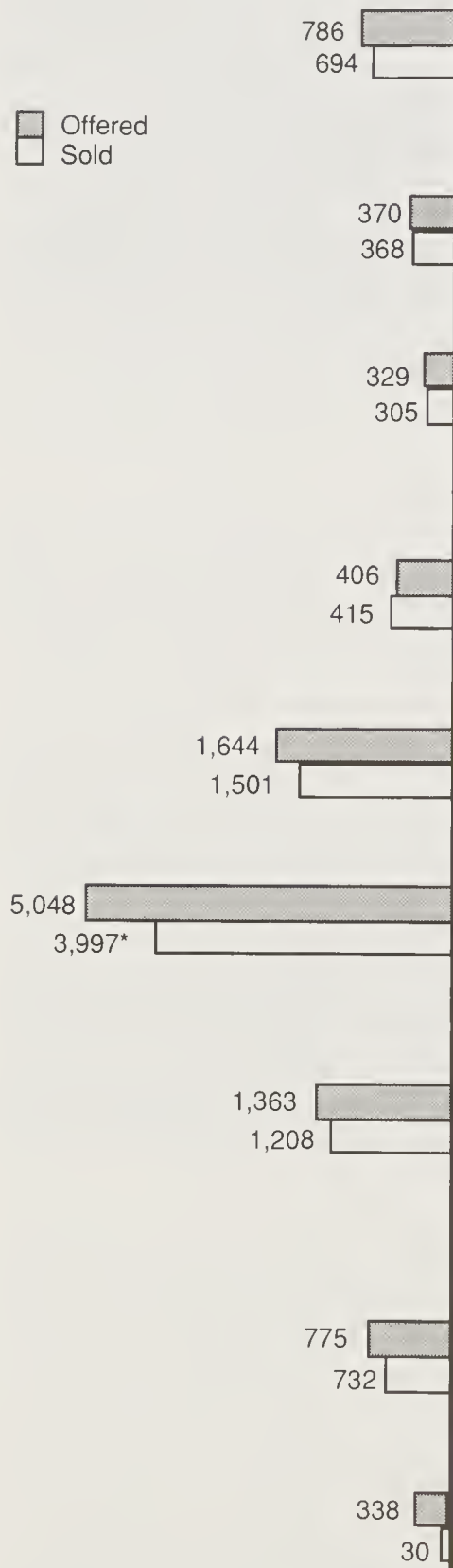
The 1990 Appropriations Act required that the amount of 1989 volume not sold because of lawsuits and conferences with the U.S. Fish and Wildlife Service be made available in 1990. The amount of 1989 carryover volume offered in 1990 was 1.1 BBF, which is 70 percent of the total carryover volume.

Section 318 required that the Forest Service review the August 1988 Record of Decision that established the Spotted Owl Habitat Area Network. The review used new information, including that generated by the Interagency Scientific Committee (ISC) addressing the conservation of the northern spotted owl. In response to the review on September 28, 1990, the Secretary of Agriculture sent an order vacating the 1988 Record of Decision to the Federal Register. The areas established in compliance with the Record of Decision were vacated,

Figure 32.

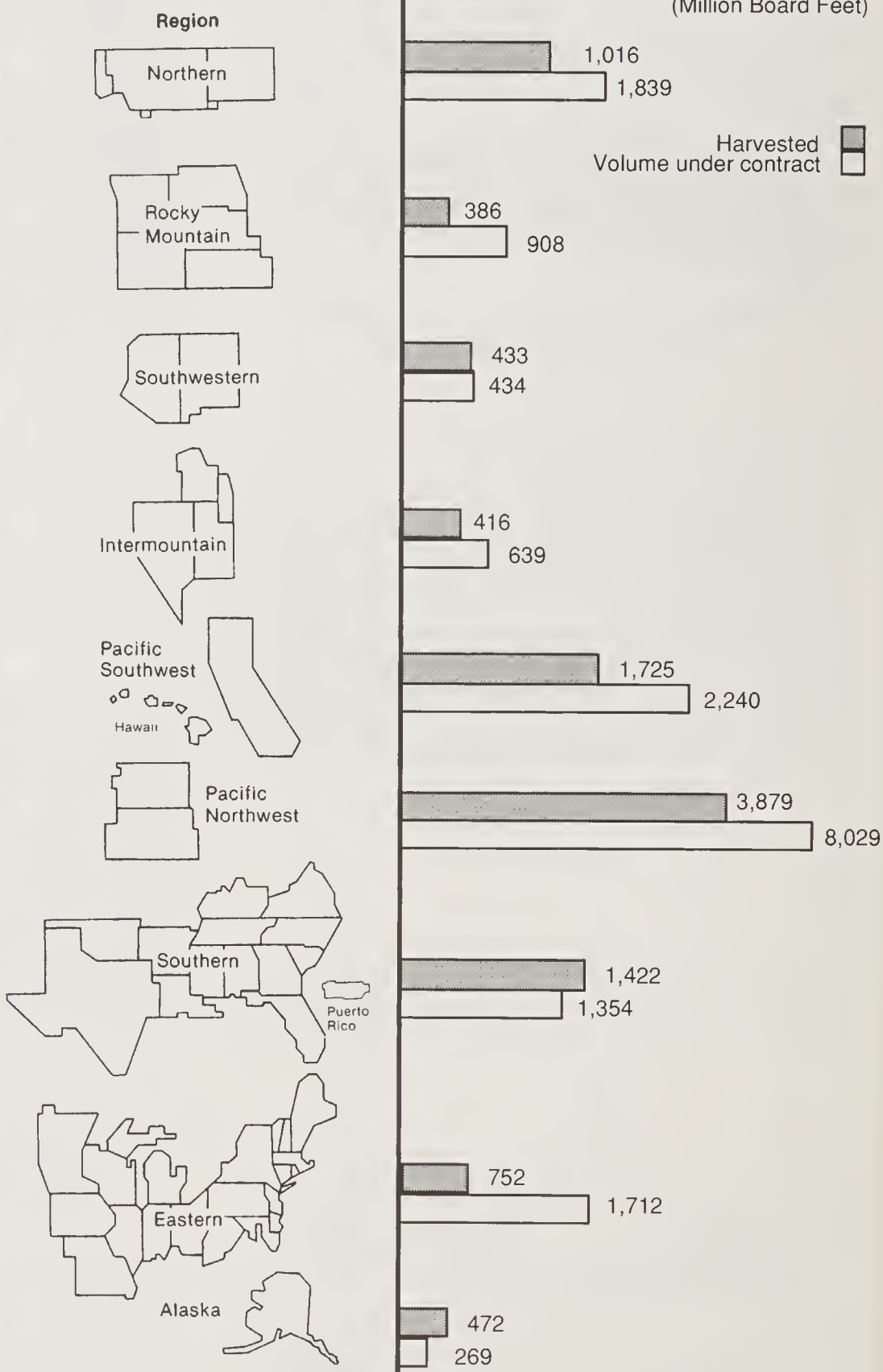
Timber Offered and Sold - FY 1990
(Million Board Feet)

Offered
Sold



Timber Harvested - FY 1990
Timber Volume Under Contract - FY 1990
(Million Board Feet)

Harvested
Volume under contract



Total Uncut Timber Under Contract—17,424 Million Board Feet

*Due to delays for spotted owl decisions and for the need to complete purchaser qualification reviews, over 1.0 BBF of offered timber sales were not awarded as sold in FY 1990 in the Pacific Northwest.



Horse logging on the Goosenest Ranger District, Klamath National Forest, California. Photo by Connie Hendrix

along with any previous decisions regarding management of the spotted owl. All final forest plans are being amended to incorporate this order and return spotted owl habitat areas to adjacent land classifications, as directed by the respective forest plan.

The ISC comprises of personnel from the Forest Service, the Bureau of Land Management, the U.S. Fish and Wildlife Service, and the National Park Service and is chaired by Dr. Jack Ward Thomas, Chief Research Wildlife Biologist for the Forest Service. It was established the fall of 1989 to develop a conservation strategy for northern spotted owl management.

On March 9, 1990, the ISC submitted its initial draft report for peer review. A final report incorporating the review comments was subsequently presented at hearings before a congressional committee. Following the release of the ISC report, the Secretaries of Agriculture and the Interior created an inter-agency task force to develop a plan to respond to the ISC report. The ISC's recommendations for management of the spotted owl are now being analyzed by the Forest Service for their economic and social effects on communities.

Salvage Sale Program

In 1990, the Forest Service sold 2,872 million board feet of salvageable timber. This volume is part of the total 1990 sell volume. Small timber operators with fewer than 25 employees purchased approximately 7 percent of the timber sold under the salvage sale program. The engineering costs for roads to operate these sales are paid by salvage sales revenues that

cover the costs of preparing and administering sales of insect-infested, dead, damaged, or downed timber.

In recent years, salvage sale offerings stemmed from the large catastrophic forest fires in the West, insect attacks in the northern Rocky Mountains and portions of the South, tree mortality from prolonged drought conditions in the Sierra Nevada Mountains, and damage caused by Hurricane Hugo. The total amount of wind-thrown timber offered in 1990 was 460 million board feet. The sold volume was 340 million board feet by 181 timber sales and 384 permits, primarily on the Francis Marion National Forest, with 80 percent of the sold volume harvested.

Timber Sale Program Information Reporting System (TSPIRS)

Every national forest tested the Timber Sale Program Information Reporting System, an accrual accounting system, in 1987 and 1988. Test results were used to refine the format and procedures for the 1989 report, which was the first official report on using the system. The reporting system's official results for 1990 display a statement of timber sale revenues and expenses (table 26), employment, income, and program level account (table 27), and the economic account (table 28). As with any new and continuing reporting system, TSPIRS will be modified and updated as improvements are identified.



Salvage logging. F.S. Photo

Report of the Forest Service

Excess Timber Receipts

The 1989 Department of the Interior and Related Agencies Appropriations Act (Public Law 100-446) required all timber receipts in excess of \$791 million be made available (until expended) to the Secretary of Agriculture for additional improvements in specific resources on the national forests. Under this provision, \$97.5 million was available in 1989.

During 1990, the Secretary directed that these funds be used for projects returning the highest public benefits in trail maintenance and construction; wildlife and fish habitat management; soil, water, and air management; cultural resource management; wilderness management; advanced sales preparation activities; and reforestation of fire-damaged areas. During 1989, the agency spent \$49.7 million of these funds, and during 1990, it spent \$37 million. At the end of 1990, the fund balance remaining to be expended was \$10.8 million. Table 29 displays accomplishments with excess timber receipts.

Cubic Measurement

Working with specialists in the timber industry, the Forest Service made good progress in developing a cubic measurement system to replace the board-foot measurement system to measure logs. This cooperative effort led to the development of a Cubic Foot Log Scaling Rule, which the Forest Service will use as it converts timber sale processes from board-foot units to cubic units over the next several years.

Cubic measurement is a consistent and constant unit of measure—one that is simpler and fairer than the board-foot unit because it is free from “rules of thumb” and adjustment factors and is easier to understand. It also reduces the costs of sampling, measuring, standing, and harvesting timber, and it can be applied to all wood products—not just lumber.

Firewood and Other Forest Products

The National Forest System provided for personal use 1.2 million cords of firewood—a value of \$5.51 million. This volume is part of the total 1990 sell volume. For many individuals and families, gathering firewood provides not only an energy alternative but enjoyable outdoor recreation. Firewood is measured, appraised, and sold in standard 128-cubic-foot cords containing about 80 cubic feet of wood. The firewood sales program works on a charge system; fees cover costs.

The national forests offer users a wide variety of other forest products. Round wood products, such as house logs, poles, posts, and fence rails, are provided to many users for commercial or personal purposes on an individual piece basis or per linear foot. Bolts of cedar and other rot-resistant species that can be split into roofing shingles are sold by the cord.

There is a popular demand for Christmas trees, both cut and dug for later planting and for the traditional recreation experience. Christmas trees and “wildings” used in landscaping are

sold on an individual tree basis. Cedar boughs are sold by the ton, as are various ferns and evergreen brush species used by the floral industry. Some products such as pinyon nuts, jojoba beans, bear grass, and mushrooms are sold by the pound. The bark of several tree species, such as the cascara tree and Pacific yew, which is used for medicinal purposes (see below), is sold by weight. Sap tapped from the trunks of various tree species is sold by the gallon for such diverse products as naval stores, maple syrup, and spruce gum. Dried cones, used for decorative purposes, are sold by the sack or by the bushel.

Pacific Yew—A Source of the Anticancer Drug Taxol

Taxol, a chemical extracted from the Pacific yew, is an extremely effective anticancer drug. Patients with ovarian cancer have shown a 40-percent response rate (tumor shrinking) to taxol treatment even when they had previously shown no response to other drugs. Breast cancer patients are predicted to show a 50-percent response. Taxol is expected to become a major cancer-treating chemical. This will require a large and steady supply of the raw material—Pacific yew bark. Attempts to produce taxol synthetically have not been successful. Taxol-like compounds have been converted from compounds extracted from yew needles.



Pacific yew seedlings being raised to test for taxol content at Couer d'Alene Nursery in Idaho. Photo by Jesse Tinsley

In September 1990, the Secretary of the Interior received a petition from 10 environmental groups and 2 cancer researchers to list the Pacific yew as a threatened species. The U.S. Fish and Wildlife Service subsequently rejected the petition to list the Pacific yew. The Forest Service is cooperating in the information collection. The proposed listing could affect the future collectibility of Pacific yew bark for extracting taxol.

The National Cancer Institute and the Forest Service are working together on short and long-range approaches to the taxol supply from Pacific yew bark. Interim collection guidelines were developed for Oregon and Washington national forests to respond to the Institute's current needs for Pacific yew bark while ensuring that Pacific yew remains a viable component of Pacific Northwest forests. To provide a long-term bark supply, the Institute and the Forest Service are collecting bark and branchlet samples to send to the Institute for taxol-content determination and to the National Forest Genetic Electrophoresis Laboratory for tests of genetic variation. Some samples will go to Forest Service tree nurseries with individual tree selections. The objective is to identify Pacific yew clones that produce high yields of taxol and to have them available for future propagation and distribution.

Exports

On August 20, 1990, the President signed the Customs and Trade Act (Public Law 101-382), which includes export restrictions of unprocessed timber under Title IV sold from the National Forest System. The Forest Service must develop regulations to enforce Title IV within 9 months of the date the act was signed into law.

Log exports from the West have totaled a little more than 4 billion board feet in 1989 and 1988 and a little less than 4 billion board feet in 1987. The total log harvest level in Oregon, Washington, Montana, Idaho, California, and Alaska was approximately 24 billion board feet over the same period. The value of the 3.6 billion board feet exported from Oregon and Washington in 1989 averaged \$477 per 1,000 board feet.

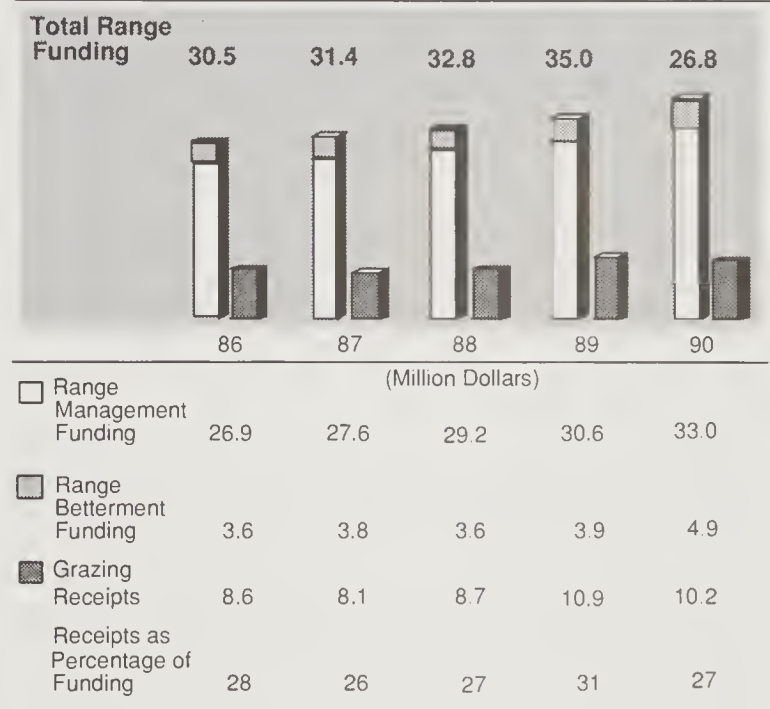
RANGE

The Forest Service manages range vegetation in forested settings and on open rangelands to maintain and improve forage production for domestic livestock, wild horses and burros, and wildlife. These management activities also protect watersheds, wildlife habitat, recreation opportunities, habitat for threatened and endangered species of plants and animals, and open spaces.

Increased public interest and concern about range conditions, riparian areas, the spread of noxious weeds, and increasing competition between uses have led to a changed emphasis in the range program. The new management approach, called Change on the Range, is designed to ensure that commodity production is environmentally acceptable and accommodates multiple uses.

The range program was funded at \$38 million (including the Range Betterment Fund) in 1990 and returned \$10.2 million to the Treasury from grazing fees (figure 33). Grazing fees ranged from \$0.84 to \$4.36 per head month in 1990. For grazing fee purposes, a head month is a month's use and occupancy of range by one weaned or adult cow, bull, steer, heifer, horse, burro, or mule, or by five sheep or goats.

Figure 33.
Range—Funding and Receipts



Nearly 104 million acres of National Forest System land are within grazing allotments. In 1990, the number of allotments was 9,834 (tables 30 and 31). The acres in each allotment are further classified as 50 million acres suitable and 54 million acres unsuitable for livestock grazing. Unsuitable lands are areas within allotments where permitted livestock are excluded for various reasons, such as the land being too steep or its condition too poor to support sustained grazing.

Currently, noxious weeds infest 4.94 million acres of National Forest System land in the Western States, and they are continuing to spread. Weeds affect many resource conditions or characteristics, such as wilderness, soil, aesthetic quality, and land productivity, as well as the forage supply and its nutritional value for wild and domestic animals. The control of noxious weeds requires coordinated efforts by all landowners in an infested area. In 1990, local weed control districts cooperating with the Forest Service treated 19,373 acres of National Forest System land. This achievement exceeded the targeted level by 4,878 acres.

Report of the Forest Service



Range conservationist weighs grasses on the Boise National Forest, Idaho. Photo by Curtis Johnson

An estimated 2,410 wild horses and 432 wild burros are grazing on National Forest System land. In 1990, 98 wild horses and burros were captured and made available for adoption to keep these herds within the grazing capacity of the range.

Livestock Grazing

In 1990, the Forest Service administered 10,527 paid permits for 9.6 million animal unit months of grazing by domestic horses, sheep, and goats. Actual grazing use at 8.1 million animal unit months was less than permitted use. (An animal unit month is the amount of forage needed to support a mature 1,000-pound cow or its equivalent for 1 month.) Table 32 displays actual grazing use in animal unit months by State. Table 33 displays annual grazing statistics for 1990. As forest plans are implemented, the total permitted animal unit months are expected to decline slightly. The 1990 RPA Program projects a 3 percent decrease (base year 1990) in permitted use (animal unit months) by 1995, with use then projected to decline slightly in the short term and gradually increase towards 2040. Reductions will be made on an allotment-by-allotment basis.

The conflict between big game and livestock, a longstanding issue, has intensified in recent years in much of the West. During May 1990, a team of representatives from the Forest Service, livestock organizations, and wildlife interests reviewed the effectiveness of forest plans in addressing this conflict in the Western United States. Action plans are now being developed by Forest Service regions and research stations in the West, with the review's external partners responding to the findings.

Range and Riparian Conditions

Approximately 73 percent of the 50 million suitable acres in allotments are in satisfactory condition. Satisfactory condition is achieved when vegetation adequately protects the soil and forage species composition and when production is at an acceptable level or an improving trend exists.

In 1989, Congress provided \$8 million to carry out recent General Accounting Office recommendations, particularly those for corrective management on overstocked allotments, riparian problems, or allotments with declining forage conditions. In 1990, 53,369 acres of riparian rangelands in the western regions of the National Forest System were treated to improve their vegetation conditions. Corrective action was taken on 334 overstocked allotments—a total of 3.7 million acres. Further efforts have been scheduled for the next several years.

With appropriated funds and other funds, the Forest Service constructed 3,328 structural improvements such as fences, water developments, and pipelines, exceeding the targeted level by 1,541 structures. Other range forage improvements accomplished included prescribed burning, seeding, and mechanical treatments on 98,594 acres, exceeding the targeted levels by 42,217 acres.

Knutson-Vandenberg Act funds covered the costs of 39 percent of the structures and forage improvements. In addition, cooperating permittees, other agencies, and volunteers provided labor, funds, and materials for 248 high-priority structural improvements and 2,249 acres of forage improvements.



Volunteers from the Manti-LaSal National Forest, the Utah Section of Society of Range Management, the Utah Division of Wildlife Resources, and the Intermountain Research Station combine forces to preserve old range research sites at the Great Basin Experimental Range. Photo by Dave Tippetts

RECREATION, WILDERNESS, AND CULTURAL RESOURCE MANAGEMENT

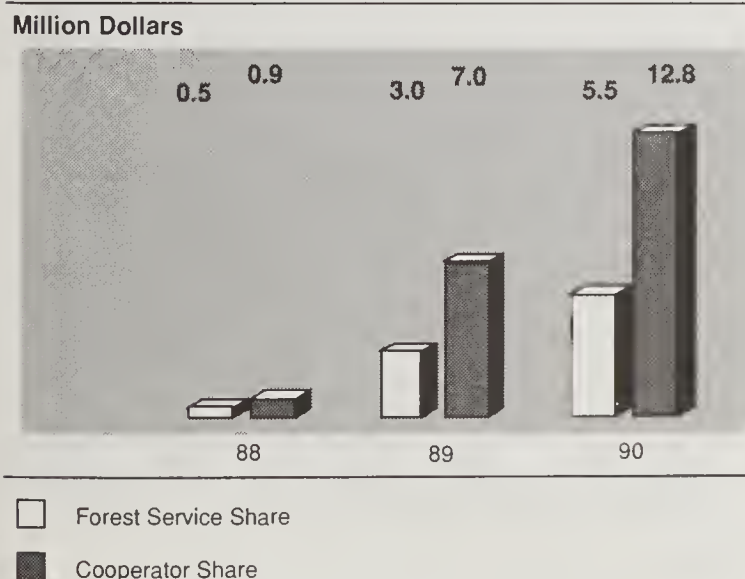
Recreation

In 1988, the Forest Service launched the National Recreation Strategy to emphasize three concepts: improving customer satisfaction, building partnerships, and pursuing excellence.

To improve customer satisfaction, field units are collecting data on what Forest Service customers want. In 1990, many national forests developed marketing plans, installed "sweet-smelling toilets" in response to customers' number-one complaint, and designed maps to meet customer needs. The Forest Service took the lead in producing an interagency draft design manual that describes how to design and construct facilities accessible to all forest visitors.

From 1989 to 1990, the number of partnerships increased from 400 to 600; partnerships returned more than \$2 for every agency appropriated dollar invested. Partners included local, county, State, and Federal agencies, private interest groups, senior citizens, students, recreation industries, interpretive associations, and private businesses. The Forest Service signed national partnership agreements with the Girl Scouts of America; the Holiday Rambler Recreational Vehicle Club, Inc.; Image Communicating, Inc.; the Cave Research Foundation; Physically-Challenged Access to the Woods; Tread Lightly, Inc.; and Times Mirror Magazines, Inc. The agency designated \$5.5 million for the Challenge Cost-Share Program in 1990 and found partners that provided more than \$12.8 million for recreation improvement projects (figure 34). The partnerships enabled the Forest Service to provide additional outdoor recreation opportunities.

Figure 34.
Recreation Challenge Cost-Share Funding



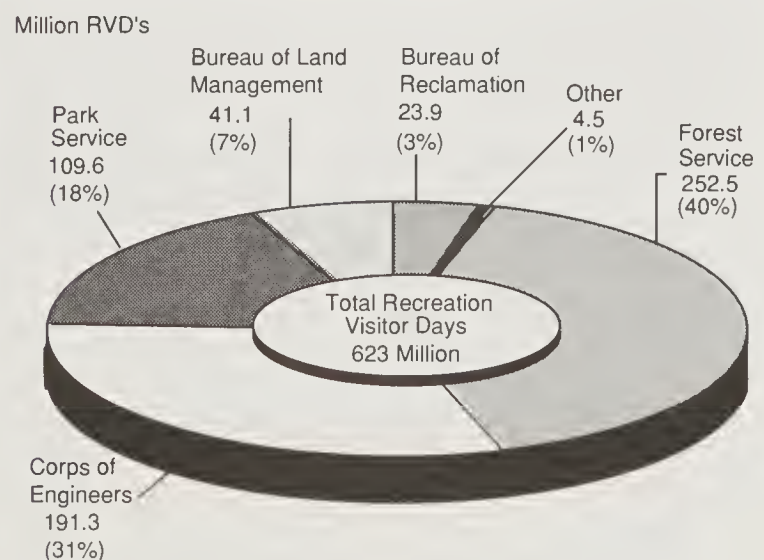
In 1990, the agency expanded the campground reservation system from 367 to almost 600 campgrounds, with a decrease in complaints. More than 80 Forest Service line officers and other Federal land managers received training in wilderness management. We are developing regional "centers of excellence" in such areas as facility design, data management, and recreation planning.

Recreation Use. National forests offer a wide spectrum of recreation activities. There are 360,000 miles of road and extensive trail systems to provide access to these activities.

In 1990, recreationists spent 263 million recreation visitor days (a recreation visitor day is 12 visit hours, by one or more persons) on national forests, a 4-percent increase over 1989 (table 35). Table 36 displays a summary of recreation use by activity for each State. Total recreation visitor days listed include wildlife user days and fish user days (a wildlife and fish user day is 12 visit hours, by one or more persons). Figure 35 shows recreation visitor days by Federal agency for 1989 (1990 data are not available for other agencies). The 1990 RPA Program projects a 17-percent increase (base year 1990) in visitor days by 1995, with visitor days projected to increase an additional 102 percent (base year 1990) towards 2040. Dispersed recreation, such as hiking, hunting, and driving for pleasure, accounted for an equivalent of 145.3 million visitor days, or approximately 55 percent of total use. Included in this unstructured total are 12 million visitor days occurring in wilderness and primitive areas.

Campgrounds, picnic areas, and swimming sites accounted for 74 million visitor days—approximately 28 percent of total National Forest System recreation use. Facilities operated by other public agencies or the private sector on national forests,

Figure 35.
1989 Recreation Visitor Days by Federal Agency*



*1990 agency data not yet available.

Report of the Forest Service



Volunteers for Outdoor Colorado construct the Williams Fork Boardwalk, a challenge cost-share project in Colorado.

Photo by Pete Wingle

such as ski areas and vacation cabins, accounted for an additional 12 percent of total visits. Other recreation activities account for 5 percent of the total recreation use. Recent data show that the national forests and grasslands account for 39 percent of the total recreation use occurring on Federal lands—more outdoor recreation than any other Federal agency.

Receipts. Total recreation receipts in 1990 were \$41 million, an 8-percent increase over 1989. Appropriations for recreation were \$153.6 million (figure 36). Fees recovered 27 percent of total recreation costs. Fees for the use of national forest

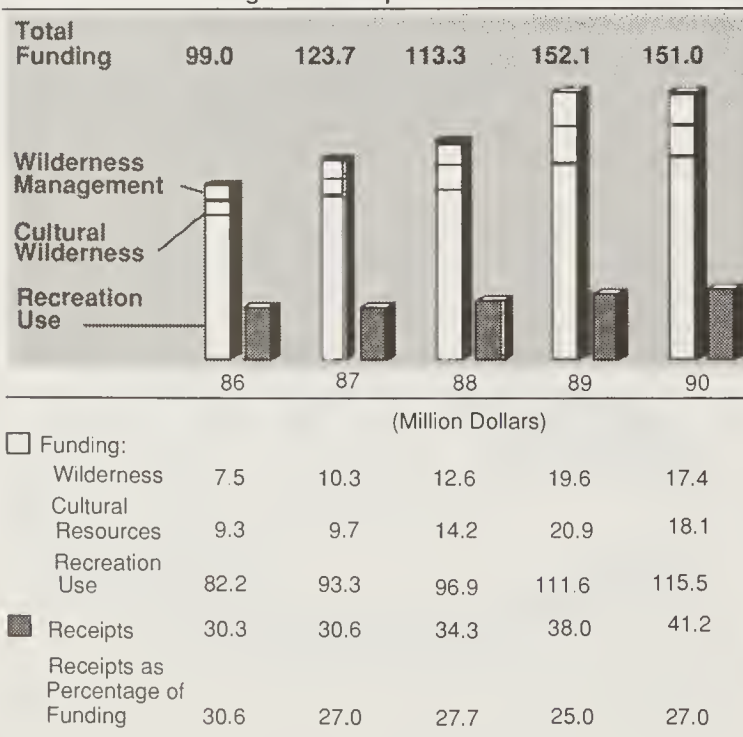
campgrounds and other facilities generated \$14 million in 1990, compared with \$14 million in 1989 and \$12.5 million in 1988. Fees for winter sports areas generated \$15 million, recreation residences contributed \$6.2 million, outfitters and guides paid \$2.5 million, resort revenues were \$1.9 million, and other recreation use fees were \$1.9 million. The total recreation special-uses fees totaled \$27.5 million in 1990, compared with \$24 million in 1989.

The number of interpretive associations increased from 43 in 1989 to 48 in 1990. Interpretive associations are nonprofit, public service organizations established to further the interpretation and understanding of resource management on the national forests. Services include visitor center staffing, map and book production and sales, and the purchase of equipment for interpretive programs. In 1990, gross receipts from interpretive associations increased 38 percent compared to 1989, from \$3.4 million to \$4.7 million. Benefits to the Forest Service increased 38 percent, from \$1.6 million to \$2.2 million.

Trails. The national forest trail system is used by cross-country skiers, hikers, horseback riders, all-terrain vehicle riders, motorcyclists, snowmobilers, bicyclists, and recreationists with disabilities. The total trail system now has 114,367 miles, an increase from 95,348 in 1975 (table 37). In 1990, the Forest Service constructed or reconstructed 1,637 miles of trails, compared with the target of 1,300 miles. Most work involved the reconstruction of existing trails, rather than new construction. In addition, we constructed 156 miles of new trails with the help of volunteers, the Youth Conservation Corps, the Senior Community Service Employment Program, and others.

Figure 36.

Recreation—Funding and Receipts



Volunteer crew builds six miles of trail along the Continental Divide on the Beaverhead National Forest in Montana. Photo by Jack DeGolia

Trail rehabilitation, creating loop trails, providing access to scenic vistas and historic sites, and joining forest trails with urban park trails were 1990 priorities. Since the mid-1970's, recreational trail use has grown by a third. Today, trail use accounts for approximately 11 percent of the total national forest recreation use.

In 1990, Tread Lightly, Inc., a nonprofit, privately funded educational corporation, was established through the cooperative efforts of the Forest Service, the Bureau of Land Management, off-highway vehicle use organizations, vehicle manufacturers, conservation groups, and off-highway drivers and riders. The corporation promotes environmentally responsible use of off-highway vehicles on public and private lands; it evolved from a 3-year program developed by the Forest Service and the Bureau of Land Management to educate drivers and riders about responsible off-highway vehicle use. Tread Lightly, Inc., will produce and distribute educational materials promoting an outdoor ethic for motorized vehicle users.

Scenic Byways Program. Driving for pleasure and viewing scenery is the largest recreation use on national forests, accounting for about 34 percent of total use. The Forest Service designated its first national forest scenic byway in 1988. Since that time, scenic byways have increased dramatically from 10 in 1988 to 75 in 1990; 22 were designated in 1990. These 3,800 miles of scenic byways are spread across 31 states, from Alaska to Florida and from New Hampshire to California.

The program identifies travel routes that traverse scenic corridors with outstanding aesthetic, cultural, or historical values. Scenic byways offer recreational motorists a natural spectrum of unique forest settings, ranging from dense rain forests to northern hardwoods to mountain tundra and alpine forests.



Scenic byway along the Apache Trail, Tonto National Forest, Arizona. Photo by Keith Grove

Recreation Facility Management. The Campsite Reservation Service, initiated in 1989, allows campers to make advance reservations at various Forest Service campgrounds located throughout the country. Reservations can be made year-round through toll-free telephone requests and mail-in reservations. A private company, which charges and retains a reservation fee of \$6 for family units and \$10 for group units, in addition to the normal user fee, operates the service. Reservations increased from 35,000 in 1989 to 60,000 in 1990, with collections to the Forest Service increasing from \$1.1 million to \$2.0 million.

Historically, as national forests became more heavily used, the Forest Service built recreation facilities to provide recreation opportunities and protect resources. These 9,800 facilities include campgrounds, trailheads, boat ramps, picnic areas, and visitor information centers; combined, they can accommodate 865,000 people at one time (PAOT). Developed recreation sites in the National Forest System experienced 74 million recreation visitor days of use in 1990, compared with 72 million in 1989. In 1990, the Forest Service provided recreation opportunities at facilities equal to 124 million PAOT days (calculated by multiplying a site's design capacity by the number of days per year that the site is open for public use). Another 14 million PAOT days were contributed by Human Resource Programs and Challenge Cost-Share projects.

A recent General Accounting Office report indicated that 51 percent of developed recreation sites are between 21 and 40 years old, and 27 percent are more than 40 years old. Deferred maintenance continues to reduce the quality of facilities and the satisfaction of visitors. This deferred maintenance backlog—\$395 million for 1990—constitutes a potential loss in the utility of major capital investments in recreational facilities.

Recreation Site Construction. In 1990, Congress appropriated \$27.8 million for recreation construction and reconstruction. Most funds were used to provide for high-priority recreation facility rehabilitation projects, as identified in forest plans, with an emphasis on health and safety-related projects.

Wild and Scenic Rivers. The National Wild and Scenic Rivers System now totals 9,366 miles; 3,369 miles are managed by the Forest Service (table 38). There are 124 rivers, or river segments, in the system nationwide; 69 are managed by the Forest Service.

In 1990, the 101st Congress added to the system the Pecos River and East Fork Jemez River in New Mexico. Forest plans and special river studies completed during 1990 included recommendations for designating 63 additional rivers, bringing the new total to 103 rivers in the National Forest System recommended for designation. As forest plans and river studies are completed, more rivers will be added to meet the Chief's goal of recommending 200 additional rivers for the system by 1993.

Report of the Forest Service



Sawtooth National Recreation Area in Idaho. Photo by Jim Hughes

Special Recreation Areas. The National Forest System contains 40 legislatively established special recreation areas totaling nearly 7 million acres: 16 national recreation areas, 5 national scenic areas, 4 national monuments, and 15 other areas. In 1990, Grand Island and Smith River National Recreation Areas and Newberry Crater National Volcanic Monument were added.

A General Accounting Office report, "National Forest Special Recreation Areas Not Meeting Established Objectives" (GAO/RCED-90-25), found that these special recreation areas were not meeting their "showcase" standards. The report attributed this shortfall to inadequate funding and recommended that the Forest Service provide Congress more detailed information about the needs of these areas. This information is being provided in 1992 budget planning. Based on priority needs, additional funds were allocated to these special areas from existing appropriated funding.

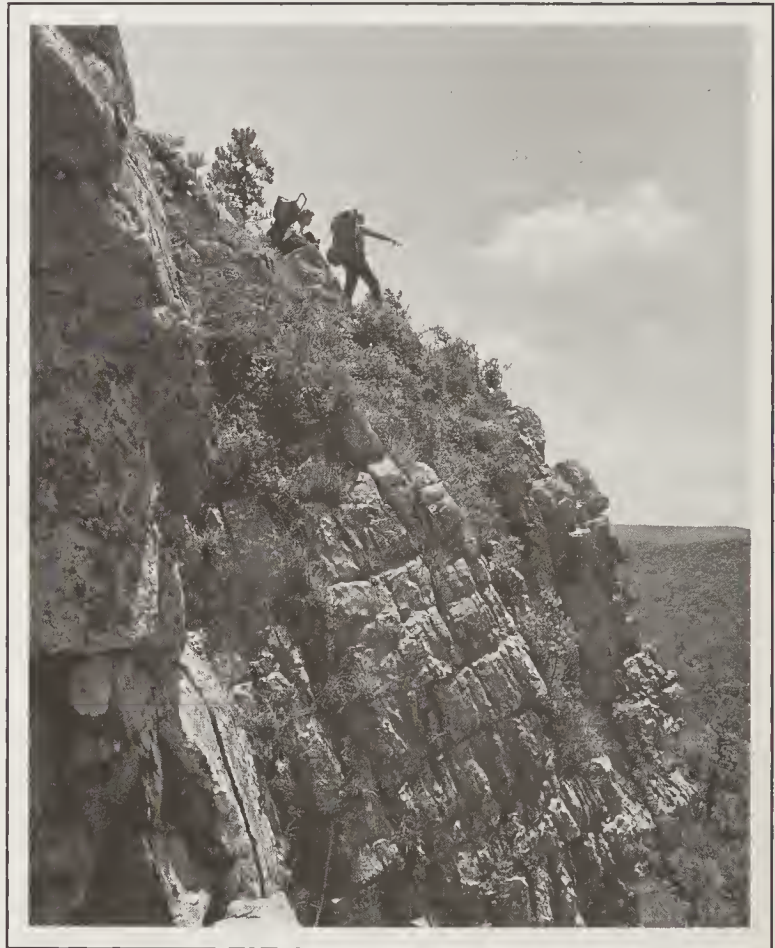
Urban National Forests. The urban national forest program, begun in 1987, emphasizes recreation opportunities for people living in metropolitan areas near the national forests. These urban forests are unique in the National Forest System because of their complex relationships with adjacent governments, interest groups, and diverse populations. In 1990, the Forest Service cosponsored the 1990 International Open Space Conference, with the theme "Open Space in the 1990's: The Critical Decade." The Palo Alto conference drew more than 600 attendees from around the United States and the world. Forest Service conference objectives focused on partnerships providing open space resources for metropolitan areas and on the development of a better understanding of the needs of metropolitan recreation customers through marketing and research.

Wilderness

Congress has designated 33 million acres of the National Forest System to be managed as part of the National Wilder-

ness Preservation System (table 39). There are 367 wilderness areas on national forests in 37 States, with a total land area about the size of Alabama. Currently, 1 of every 6 acres of National Forest System land is managed as wilderness. The 1990 RPA Program projects a 6.5-percent increase (base year 1990) in wilderness acres by 1995, with wilderness acres projected to continue to increase gradually from 1995 until 2040.

Our congressional mandate is to preserve an enduring resource of wilderness, where natural processes are allowed to operate freely and humans are only temporary visitors. Wilderness management provides for scientific, scenic, educational,



Flathead Wilderness, Ouachita National Forest, Arkansas.

Photo by Faith Skoog

conservation, historical, recreation, and other uses that are consistent with wilderness resource protection. To protect the wilderness resource, the Forest Service:

- Educates users on wilderness benefits and how to protect them.
- Enforces regulations established to protect wilderness.
- Rehabilitates damaged areas.

- Maintains inventory data for wilderness uses and resource conditions.
- Prepares and implements plans based on inventory data for protecting the wilderness for future generations.

A total of 12 million visitor days in wilderness were recorded in 1990—approximately 4.5 percent of the recreation use on national forests. Hunting, fishing, and trapping, under applicable State and Federal laws, are allowable recreational uses within national forest wilderness areas. Other allowable uses are outfitting and guiding services; management measures to control fire, insects, and disease; aircraft and motorized use where it pre-existed and is specified in the designating legislation; adequate access to private and State lands; scientific data collection, using methods compatible with protecting wilderness environment; livestock grazing occurring before designation; and mineral exploration and development under specific legal situations.

The Forest Service is placing greater emphasis on managing nonrecreational resources of wilderness. In response to the 1988 fire season, wilderness fire management plans are being rewritten to strengthen decisionmaking criteria on the use of fire for wilderness management. In 1990, five regions held workshops to develop screening values for reviewing Prevention of Significant Deterioration permits that might alter air-quality-related values in the 88 Class I airshed areas (wilderness areas exceeding 5,000 acres as of August 7, 1977) protected by the Clean Air Act of 1977. Wilderness inventory and monitoring needs were defined and data elements identified for geographic information systems. For the national study on the effects of aircraft noise on wilderness visitors, field observations were made in 3 wilderness areas and visitor impacts surveyed in 12 wilderness areas.

Conservation and wilderness user groups became more involved in wilderness management activities, particularly the "Leave No Trace" public education program and wilderness planning. A new brochure and a video on Leave No Trace practices were produced for camping equipment stores and Forest Service visitor centers. To support forest plans, wilderness implementation schedules are being written for most wilderness areas. In May 1990, the first national wilderness management training for line officers was held at the Ninemile Wildlands Training Center near Missoula, Montana, for 55 participants, including regional foresters and forest supervisors.

Cultural Resource Management

The Historic Preservation Act of 1966 directs the Forest Service to identify and protect significant cultural resources before land is disturbed and to manage these resources in the public interest. The Forest Service conducts surveys to identify and evaluate cultural properties before proposed projects are approved. During 1990, we completed cultural surveys on 1.2

million acres and identified 12,800 historic or prehistoric properties. Of this number, approximately 800 were determined to be significant, while another 10,000 need further evaluation. In 1990, 47 cultural properties were submitted to the National Register of Historic Places for listing.

To promote public enjoyment of cultural resources, we began a program called "Windows on the Past." The goals of the program are to:

- Create recreational opportunities for forest visitors.
- Develop an awareness about our cultural resources.
- Instill a feeling of public responsibility to protect the Nation's prehistoric and historic sites.
- Develop partnerships and volunteerism.



These totem are cultural representation of the people who first settled within the Tongass National Forest in Alaska. F.S. Photo

Report of the Forest Service

In 1990, a Windows on the Past workshop was held to strengthen the program, to emphasize how partnerships protect and interpret cultural resources, and to recognize outstanding accomplishments in cultural resource management. The agency launched the "Passports in Time" program to encourage volunteers in cultural resource activities. Ten Passport in Time projects were conducted, from Utah to Georgia to the Great Lakes.

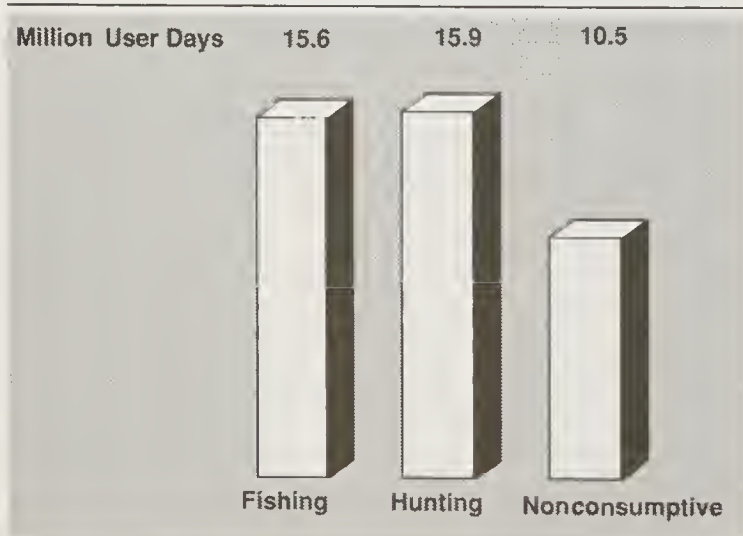
WILDLIFE AND FISH

The National Forest System has more diversity of wildlife, fish, and plant species than any other single land owner in the country. The Forest Service seeks to maintain biological diversity, protect and recover endangered species, and respond to public demands for recreational and commercial uses of fish and wildlife.

In 1990, National Forest System lands provided 42 million user days of recreation for hunters, anglers, and nonconsumptive users of wildlife and fisheries—17 percent of all recreation use on the national forests (figure 37). In 1990, reported hunting and fishing uses are less than 1989; however, these decreases are because of changes in data collection, not decreases in use. Nonconsumptive use increased even with the data collection change. According to the 1990 RPA Program, the annual value of hunting provided on the national forests is estimated at \$636 million, fishing at \$1.03 billion, and nonconsumptive wildlife and fish uses at \$441 million. The 1990 RPA Program projects a 15-percent increase (base year 1990) in user days by 1995, with user days projected to continue to increase 183 percent (base year 1990) toward 2040. Congress appropriated \$82.5 million in 1990 for management to sustain or increase benefits (figure 38).

Figure 37.

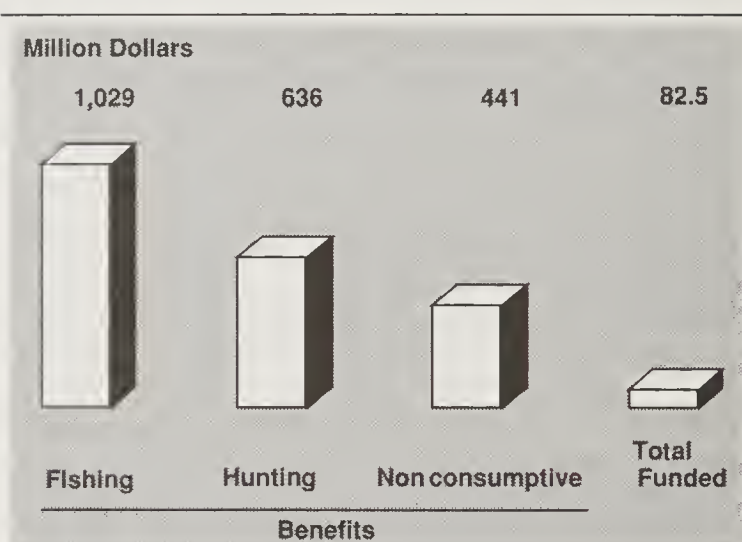
1990 Hunting and Fishing User Days



Note: Wildlife and fish user days are also included in recreation visitor day total.

Figure 38.

Wildlife and Fisheries Funding and Benefits in 1990



The Forest Service manages habitat to produce game and nongame species; protect threatened, endangered, and sensitive species, and benefit all types and groups of national forest users. Sound habitat management sustains the biological diversity of the Nation's forests. Biological diversity provides for recovering populations of threatened and endangered species, maintaining viable populations of all plants and animals, protecting special habitats, and ensuring productivity of selected species for recreational and commercial uses.

The Forest Service cooperates with State fish and wildlife agencies in managing animal populations and develops conservation programs with State wildlife agencies, other Federal

Figure 39.

Wildlife Challenge Cost-Share Funding

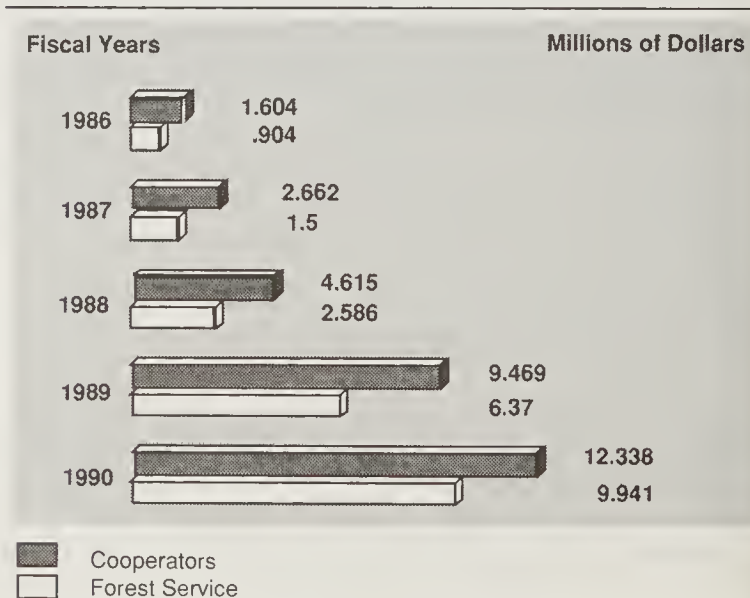
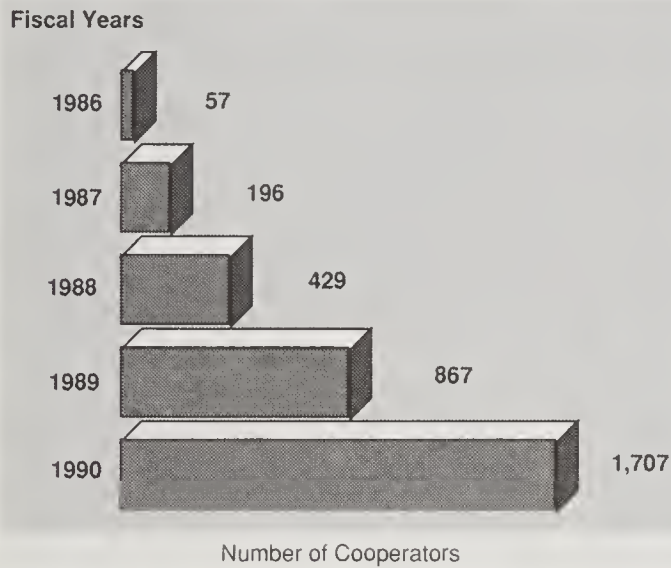


Figure 40.
Wildlife Challenge Cost-Share Cooperators



agencies, and fisheries and wildlife conservation groups. Examples of programs are "Join Us," an effort to strengthen public-private partnerships in wildlife habitat and fisheries management; "Rise to the Future," a national effort to provide emphasis on fisheries enhancement; and "Get Wild," a national effort that includes wildlife habitat enhancement programs, such as "Eyes on Wildlife" and "Making Tracks." Numbers and dollars of cost-share cooperators have increased dramatically in recent years (figures 39 and 40).

Threatened, endangered, and sensitive species are among the Nation's most treasured resources, and their recovery and conservation are central to the Forest Service's mission. A national task force established in 1989 was charged with developing a strategy to strengthen and increase program emphasis within the Forest Service. An action plan was completed in April 1990, and implementation has begun. Through the program "Every Species Counts," the Forest Service and its partners are working to expand contributions to species recovery and conservation.

Wildlife and Fish Habitat Improvements

During 1990, the Forest Service managed habitats with other resource programs to maintain current population levels of wildlife and fish. Appropriated funds improved 133,059 acres of wildlife habitat, and with Challenge Cost-Share Program partnerships, we exceeded budgeted targets for habitat improvement (table 41). An additional 195,514 acres of habitat were restored or improved through Knutson-Vandenberg Act funds from timber harvest receipts.

In 1990, the following habitat improvement activities were accomplished in cooperation with States, other Federal agencies, and conservation organizations. These examples demon-

strate a program shift toward noncommodity program aspects, as directed in the 1990 RPA Program.

Management of Bighorn Sheep. The White River National Forest and the Colorado Division of Wildlife reintroduced bighorn sheep into their historic range, improved habitats on winter range, and conducted studies of existing herds to determine habitat use and limiting factors.

Walk-in Turkey Hunting Area. The Sylamore Ranger District on the Ozark-St. Francis National Forest, the National Wild Turkey Federation, and the Arkansas Game and Fish Commission established a walk-in turkey hunting area totaling 9,371 acres.

Sandia Mountain Hawk Watch Trail. The Cibola National Forest worked with the Western Foundation for Raptor Conservation and the Central Rio Grande Chapter of the Audubon Society to complete the construction of 1 1/2 miles of trail to improve public access to the Sandia Mountain hawk watching site. The site is used to view and record raptor migrations. The Western Foundation for Raptor Conservation completed a brochure highlighting the importance of raptors in the ecosystem and invited public participation in the hawk watching effort.

Warm-Water Fisheries. The Tonto National Forest, the Arizona Game and Fish Department, and Anglers United improved fish habitat by installing 40,000 plastic fish-cover structures in Saguaro and Canyon Lakes. A 300-foot-long floating fishing pier for disabled anglers was placed at La Barge Cove on Canyon Lake.

Cold-Water Fisheries. The Deschutes National Forest, Fish America, Trout Unlimited, and other groups installed 250 structures in the Tumalo Creek Watershed to provide needed fish habitat and improve streambank stabilization.

Anadromous Fish. A fish ladder on the Ketchikan Ranger District of the Tongass National Forest has made 24 acres of stream habitat and 145 acres of lake habitat available to coho, sockeye, and pink salmon and steelhead trout, contributing an additional 545,000 pounds annually to the fishery, with an estimated annual value of \$230,000. Partners included the Alaska Department of Fish and Game, the Ketchikan Pulp Company, the Jim Leslie Cutting Company, and the South Coast Construction Company.

Castilleja aquariensis Survey. During 1990, through the Challenge Cost-Share Program, the Dixie National Forest and the Utah Natural Heritage Program inventoried the potential habitat of the sensitive plant species *Aquarius* Indian paintbrush (*Castilleja aquariensis*), endemic to Boulder Mountain. Monitoring studies were established to assess the effects of livestock grazing and timber management activities.

Growth of Partnerships for Habitat Improvement

In 1990, Congress authorized \$7.4 million for the wildlife and fish Challenge Cost-Share Program to accelerate maintaining and enhancing wildlife habitat and fisheries on national forests through partnerships with conservation organizations, State and Federal agencies, and private individuals. Challenge Cost-Share projects included improving forest habitat for game species such as deer, elk, grouse, and moose and nongame species such as songbirds; improving several thousand miles of fisheries; reintroducing peregrine falcons; building nest boxes; seeding around waterholes for wildlife food and cover; installing bass spawning boxes; and conducting surveys to establish protective measures for endangered species.

Funded at \$7.4 million in 1990, the program helped increase the number of wildlife and fish partnerships to more than 1,700, an increase of more than 90 percent over 1989 participation. Somewhat more than \$3 of Challenge Cost-Share money was contributed by partners for every \$2 of appropriated funds.



Partnerships. Photo by Mary Lynn Cagle

Wildlife and Fisheries Habitat Relationships

The 1990 emphasis of the Wildlife and Fisheries Habitat Relationships Program was to improve information, methods, and technology to ensure that habitat needs of wildlife and fish were addressed in forest plans. Program staff, in cooperation with the regions and research, determined information needs and habitat management guidelines for the marten and fisher, two species that are listed as sensitive, to ensure survival of these species. Tools and methods to evaluate the cumulative effects of management on wildlife and fish habitats continue to have high priority. Monitoring was another 1990 emphasis.



Fisheries habitat improvement, Tonto National Forest, Arizona.

Photo by Jeff Topping

Wildlife and Fish program staff continued to serve a prominent role in continuing education about wildlife, fisheries, and other related disciplines and for cooperative programs with universities.

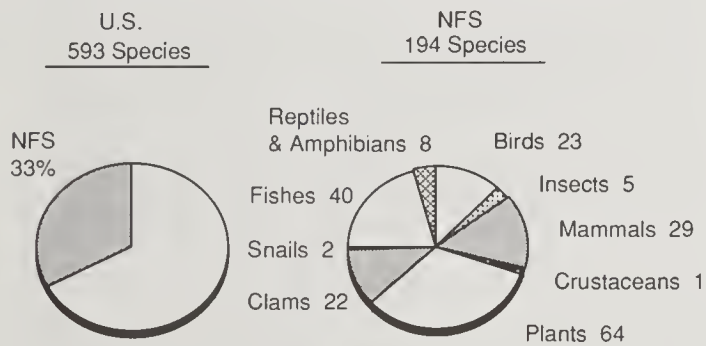
Fisheries Habitat Relationship

The Fisheries Habitat Relationship Program, building on goals established for habitat survey information and the database, developed basin surveys and an applications short course to provide biologists with the latest inventory techniques and database support. The program has started using geographic information system support and applications for habitat inventories and is developing limiting-factors procedures for resident fish using this technology.

Threatened, Endangered, and Sensitive (TES) Species Management

National forests and grasslands are home to 194 plant and animal species listed by the U.S. Fish and Wildlife Service as threatened or endangered (figure 41). This is 33 percent of all the federally listed species nationwide. The Forest Service has identified more than 2,000 sensitive species. Successful recovery of these species depends on Forest Service collaboration with Federal and State agencies, private organizations, and individuals.

Figure 41.
Species Federally Listed as Endangered or Threatened



National forests provide habitat for 33 percent of all federally listed species in the United States. These species include all varieties of life, from mammals to plants to clams.

Coordination and implementation of recovery activities are part of TES species program operations, which were funded at \$11.2 million. Through its "Every Species Counts" program, the Forest Service is currently broadening the emphasis of the TES species program to cover plant communities.

Funding for habitat improvement increased from \$7.1 million in 1989 to \$9.9 million in 1990. In 1990, 399 partners contributed \$2 million on 367 projects. This recovery, conservation, and monitoring work involved 5,661 acres and 528 structures. New recovery plans the Forest Service coordinated with the Fish and Wildlife Service in 1990 included the Aplando falcon, Florida scrubjay, Maguire's primrose, Uinta Basin hookless cactus, bonytail and humpback chubs, and two species of cats of the Southwest.



Artist draws sensitive plant, *Hymenocalus herqi*, Apalachicola, National Forests of Florida. Photo by R. Costa

Accomplishments in 1990 for TES plants included implementing recovery tasks for MacFarlane's four-o'clock (*Mirabilis macfarlanei*) in the Pacific Northwest Region and Mead's milkweed (*Asclepias meadii*) in Illinois. Five regions updated their databases on sensitive plant species.

Western regions involved with grizzly bear recovery are implementing a long-range management program titled "Charting the Course—The Forest Service Grizzly Bear Conservation Program." More than \$1.6 million from several sources was invested in grizzly bear conservation in 1990. Funds were spent on mapping bear habitat, reducing human-grizzly conflicts, improving habitat, and providing public education.

Forests and regions have worked closely with State natural heritage inventory programs to conduct surveys and develop conservation strategies for sensitive species, the majority of which are plants. These strategies provide needed management actions to maintain population viability, preventing species from becoming federally listed. The Forest Service completed 40 conservation strategies or species management guides in 1990.

SOIL, WATER, AIR, AND WEATHER

The objective of soil, water, and air management is to ensure favorable conditions of water flows, quality, and quantity adequate for public needs and resource requirements. Programs serve to minimize impacts from land management activities, maintain the water resource on national forests, protect adjacent airsheds from adverse effects of air pollution, and provide weather information for resource management and protection activities.

Specialists on national forests and grasslands develop soil and water conservation practices that reduce erosion and sedimentation to protect water quality and soil productivity. A cooperative effort to control non-point-source pollution of water was initiated with the Environmental Protection Agency and various State water quality agencies. The Forest Service established a nationwide soil monitoring system based on soil quality standards. This effort quantifies the effects of management practices on soil productivity.

Soil Resource Inventories

In 1990, soil inventories were completed on 6.7 million acres, compared with 6.2 million in 1989. Inventories on approximately 60 percent of all national forests are complete. By 1995, this should increase to approximately 70 percent. At the current rate of inventory, the goal of inventorying all National Forest System lands by the year 2000 will not be met. However, the goal could be met with an acceleration of the inventory program.

Some national forests are taking an ecological approach to soil inventories. For example, in 1990, the Huron-Manistee National Forest inventoried 80,000 acres using the Integrated

Report of the Forest Service

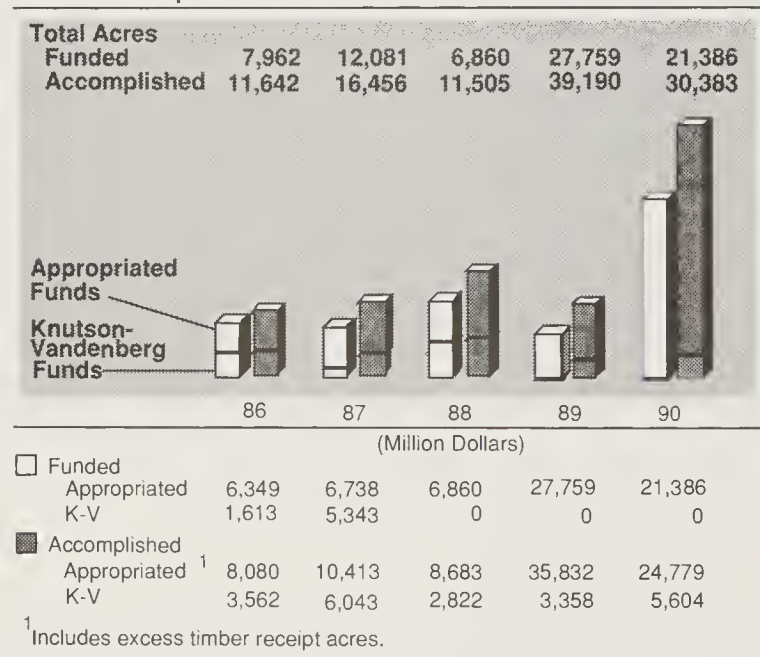
Ecological Classification System, making improved determinations of capability to increase awareness of ecological processes and effects of land management. Other regions and forests are using similar approaches.

The Forest Service conducts most soil inventories as part of the National Cooperative Soil Survey. This information is vital for determining what activities can take place and what special management requirements may be necessary to avoid damaging soil and water resources. The ecological unit mapping effort provides vegetation and soil information for planning and analysis.

Soil and Water Resource Improvement

During 1990, soil and water conditions were improved on 33,815 acres. Appropriated funds covered costs on 15,970 acres, excess timber receipts on 8,809 acres, and Knutson-Vandenberg Act funds on 5,604 acres (figure 42). The remaining 3,433 acres were improved through cooperative partnerships, volunteers, and human resource programs. The 1990 RPA Program projects a 39-percent increase (base year 1990) in watershed improvement acres by 1995, with improvement acres gradually decreasing toward 2040.

Figure 42.
Watershed Improvements—Acres



Land and resource management practices contribute to improving overall watershed conditions. Watershed conditions are improved coincident with various range, wildlife, and fish habitat improvements, such as fencing to control livestock and reseeding disturbed areas. Watershed improvement activities stabilize soils and increase productivity on many specific sites, but basin-wide improvements in watershed condition occur over longer time periods.

Riparian and Wetland Management

Riparian areas make up approximately 1 percent of the National Forest System land base in the Western States, and wetlands make up about 5 percent of the National Forest System. More than half of these wetlands are in Alaska.

The Forest Service is continuing its efforts to assess and improve riparian areas through standards and guidelines in forest plans. Regions are developing forest plan implementation approaches that stress maintaining and improving riparian values. In 1990, the regions developed and began implementing riparian management strategies, designed to achieve forest plan standards on 75 percent of the currently unsatisfactory riparian conditions.

Soil and Water Quality Monitoring

National forests and grasslands are monitoring the effects of management practices on watersheds to ensure that environmental standards for water quality and erosion control are met. For example, in 1990, specialists from the Shasta-Trinity and Six Rivers National Forests began prototype monitoring of cumulative watershed effects. In another effort, the Southwest Region, working with the Pacific Southwest Station, is determining the effects of land use on watershed processes and impacts to fish and aquatic ecosystems. The Forest Service is developing a monitoring program and guidelines for implementing and validating guidelines for cumulative watershed effects.

The Kisatchie National Forest monitored soil erosion from a reforested area prepared with a roller drum chopper and then slash-burned during 1989 and 1990. First results show erosion to be within the tolerable losses established in the forest plan.



Water sampling for aquatic life on the Bridger-Teton National Forest in Wyoming. Photo by Jill Bauermeister



Portage Glacier has been retreating since the early 1900's. Photographic monitoring has shown significant thinning and recession.

Photo by Dave Blanchet

Long-Term Soil Productivity Study

To provide standards and guidelines evaluating the effectiveness of management in maintaining soil productivity, the Forest Service is establishing soil quality threshold standards for soil properties. These standards will help in maintaining productivity and reversing impaired soil conditions that reduce productivity. The standards will serve as benchmarks to guide forest practices, monitor trends in soil conditions, and assess the effectiveness of soil and water conservation practices.

Little is known about how large a loss different soils can tolerate before long-term productivity is reduced. A cooperative, nationwide effort on soil productivity has been initiated by Forest Service Research and the National Forest System. The effort seeks to quantify soil disturbance effects from management activities, validate soil quality standards, and better understand the fundamental relationships between soil properties and long-term productivity in major forest ecosystems in the United States.

Emergency Watershed Rehabilitation

In 1990, under the authority of the Agriculture Credit Act of 1978, the Forest Service applied emergency rehabilitation measures to 795 acres of flood-damaged watersheds to protect lives and property downstream. Based on 16 fire assessments for

emergency burn rehabilitation, more than \$1 million was approved for emergency recovery work on 36,000 acres. The initial emergency work to stabilize soils and minimize runoff to protect water quality was completed during 1990. Monitoring and maintenance followup will avoid or prevent flooding damage from the fall and winter storms.

Instream Flows Analysis

In 1990, the Forest Service completed field work quantifying streamflows needed for channel maintenance, fish habitat, and recreational uses in the upcoming Snake River adjudication. This work will form the numerical basis for Forest Service claims for instream flows in this basin. The Northern, Intermountain, and the Pacific Northwest Regions cooperated in this task.

Air Resource Management

In 1990, the Air Resource Management program maintained 45 active visibility monitoring sites and conducted several lake and stream chemistry and biology studies, as well as conducted lichen and other plant evaluation studies. The agency operated three aerometric monitors that measure particulates, ozone, and acid deposition. The 1990 RPA Program projects a 47-percent increase (base year 1990) in monitoring sites by 1995, with sites projected to increase 157 percent (base year 1990) toward 2040.



A scientist sets up a solar-powered quality monitoring station on the Medicine Bow National Forest in Wyoming. Photo by Jill Bauermeister

The process for screening air-quality permit applications for potential adverse impacts on Class I airshed areas (wilderness areas exceeding 5,000 acres as of August 7, 1977) broadened substantially in 1990, through regional and forest-level workshops. Forest Service review and evaluation of proposed major industrial sources indicate continuing degradation of air quality in Class I areas, particularly in the Eastern United States. Through cooperative efforts with other agencies, the Forest Service encouraged reduction in atmospheric deposition of sulfur and nitrogen and ambient concentration of ozone.

Weather Program

The Weather Information Management System (WIMS) has been under development since December 1989. WIMS will replace the current Administrative Forest Fire Information Retrieval and Management System (AFFIRMS) by mid-1992. A major feature of WIMS will be its direct connection with the National Weather Service's computer network and that agency's narrative and graphic products providing integrated weather data. Onsite weather data are collected through the Remote Automatic Weather Station.

FEDERAL FACILITIES COMPLIANCE PROGRAM

The Federal Facilities Compliance Program brings Federal facilities into compliance with several laws enacted to protect the public and the environment. In 1990, the Forest Service received \$12.8 million from USDA for compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Resource Conservation and

Recovery Act (RCRA). Funds were used for preliminary assessments and site investigations at 74 CERCLA sites; for remedial action and cleanup measures at 56 CERCLA sites, including mines, sanitary landfills, and illegal hazardous material dumps; for site investigation and testing for hazardous wastes at 45 RCRA sites; for corrective actions related to hazardous waste at 63 RCRA sites, and for the removal, disposal, and associated cleanup of 537 underground storage tanks.

In 1990, 163 pollution abatement projects were initiated or completed using appropriated funds of \$4 million. Typical projects included the elimination of pollutant discharges into surface and groundwaters (Clean Water Act); the mitigation of asbestos and radon pollution in structures (Clean Air Act); the upgrading of potable water systems at administrative and recreation sites (Safe Drinking Water Act Amendments); and the identification and removal of transformers, capacitors, and other equipment containing polychlorinated biphenyls (Toxic Substances Control Act).

The Forest Service developed a database to facilitate the scheduling and reporting of pollution abatement projects. A July 1990 update of the database listed more than 3,200 projects at a total projected cost of \$216.9 million for the 1990 to 1995 period.

FOREST ROAD SYSTEM

Construction and Reconstruction

The Forest Service designs, constructs, and reconstructs roads to the minimum standard necessary to provide safe access for forest resource activities and uses. During 1990, 1,966 miles of new roads were constructed and 4,553 miles of existing roads were reconstructed (figure 43). Tables 42 and 43 list road and bridge construction and reconstruction projects by funding type: appropriated funds, purchaser credit, and purchaser election. These totals include 26 miles of reconstruction and 1 mile of new construction on the Tongass National Forest. Most of these roads were single lane (12 to 14 feet wide), unsurfaced, and designed to minimize any disturbance to the land and the surrounding environment. The 1990 RPA Program projections show minor increases in total system road miles toward 2040.

New road construction was 25 percent (647 miles) less than planned. The miles of existing road reconstructed exceeded the planned level by 8 percent (329 miles). The shortfall in new construction resulted from appeals and delays of timber sales planned in unroaded areas and from the substitution of projects already roaded. Resource activities in previously roaded areas typically are more widely dispersed to keep environmental impacts within forest plan standards and guidelines, resulting in more miles of reconstruction than planned. These shifts caused the duplication of planning, survey, design, and contract preparation costs and preparation delays for future resource activities.

Figure 43.

SUMMARY OF PLANNED VS. ACTUAL ACCOMPLISHMENTS FOR FY 1990

Funding Source ²	Construction Miles ¹ (New Roads)		Reconstruction Miles ¹ (Improved Existing Roads)	
	Planned	Accomplished	Planned	Accomplished
PCP	2,333	1,789	3,552	3,715
PEP	114	41	154	117
FRP	167	136	517	721
Total	2,614	1,966	4,223	4,553

¹ Does not include roads constructed or reconstructed using Tongass Timber Supply Fund.

² Funds for forest road construction and reconstruction come from several sources. The Purchaser Credit Program (PCP) allows timber purchasers a credit against the price of the timber they buy, equal to the cost of the roads they construct or reconstruct to harvest timber. The Purchaser Election Program (PEP) allows purchasers qualified as small businesses to have the Forest Service build the roads using funds from timber receipts. The Forest Road Program (FRP) finances the construction and reconstruction of recreation, general purpose, and some timber access roads from appropriated funds. In addition, FRP funds engineering, rights-of-way, and administrative support for all road construction and reconstruction done under PCP, PEP, and FRP. FRP finances the environmental studies and interdisciplinary, professional analysis (including archaeologists, biologists, landscape architects, and so forth) associated with road construction activities. FRP also funds the Forest Service share of cooperative road work with neighboring landowners or volunteers.



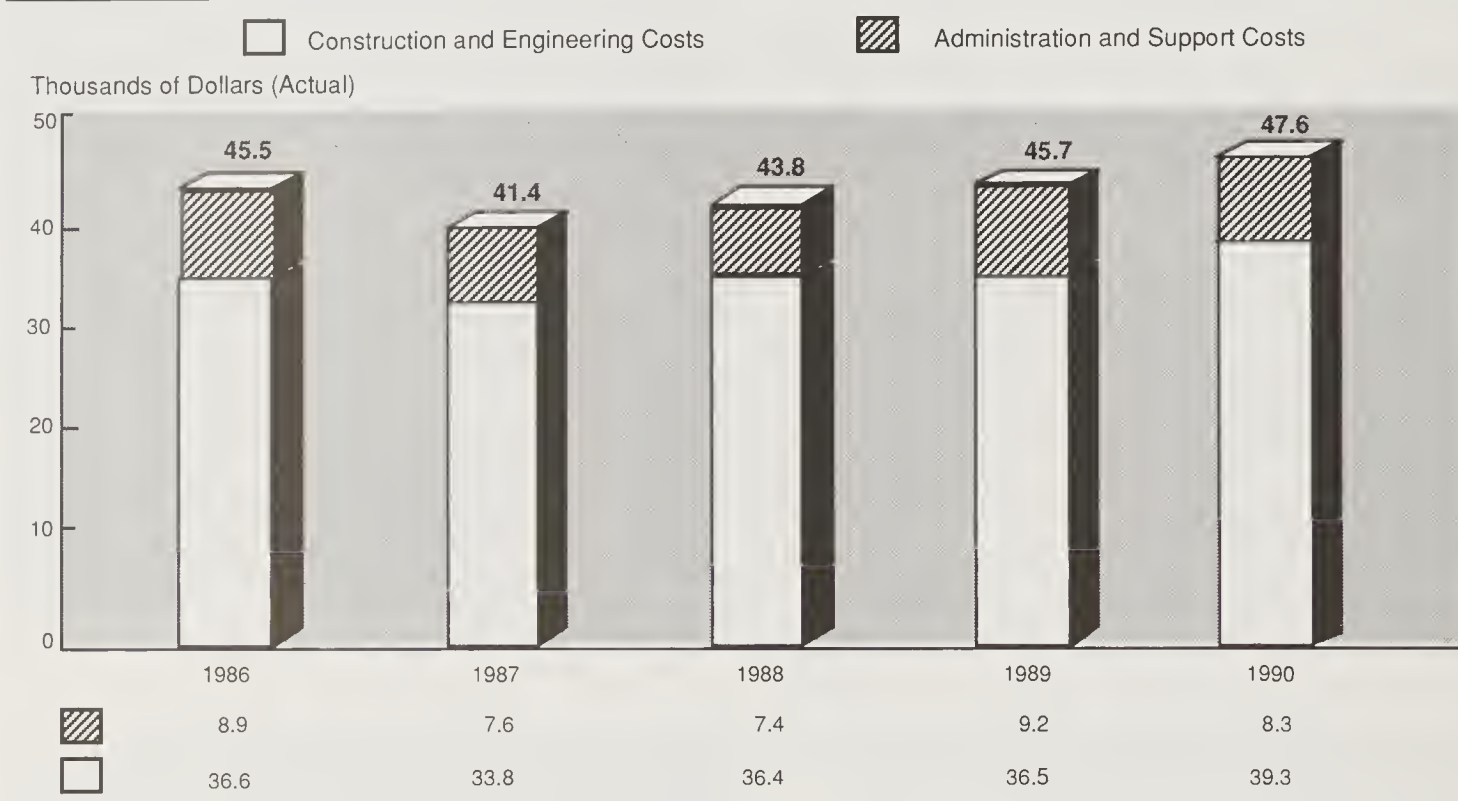
Arterial roads make up five percent of the National Forest transportation system. Photo by Randy Wilkerson



Mountain biking is popular on our collector roads. Photo by Randy Wilkerson

Figure 44.

National Summary of Total Cost and Unit Cost—Road Construction and Reconstruction



SUMMARY OF UNIT COSTS FOR ROAD CONSTRUCTION AND RECONSTRUCTION
(Thousands of Dollars per Mile)

FY		R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	National
1986	A	32.7	31.0	28.1	29.3	45.2	42.9	28.5	26.6	184.7	36.6
	B	8.1	5.0	12.0	10.8	6.3	6.9	3.5	7.4	106.8	8.9
	Total	40.8	36.0	40.1	40.1	51.5	49.8	32.0	34.0	291.5	45.5
1987	A	29.1	22.9	20.1	27.3	43.1	40.6	25.1	24.4	163.9	33.8
	B	5.5	3.7	5.5	8.0	7.7	5.6	3.1	7.1	66.5	7.6
	Total	34.6	26.6	25.6	35.3	50.8	46.2	28.2	31.5	230.4	41.4
1988	A	30.8	27.4	23.4	19.1	34.7	43.6	27.3	32.5	165.3	36.4
	B	5.6	6.1	5.6	9.2	6.5	5.9	4.6	12.1	25.3	7.4
	Total	36.4	33.5	29.0	28.3	41.2	49.5	31.9	44.6	190.6	43.8
1989	A	35.2	27.3	19.9	22.4	41.3	42.0	25.8	33.7	135.1	36.5
	B	6.1	8.8	8.1	11.2	13.6	9.5	4.8	11.4	25.4	9.2
	Total	41.3	36.1	28.0	33.6	54.9	51.5	30.6	45.1	160.5	45.7
1990	A	41.4	23.7	16.6	23.7	40.4	46.3	26.5	31.2	136.9	39.3
	B	8.0	7.6	5.9	14.8	14.2	5.8	6.4	10.6	30.7	8.3
	Total	49.4	31.3	22.5	38.5	54.6	52.1	32.9	41.8	167.6	47.6

A - Construction and Engineering Costs
B - Administration and Support Costs

Most new roads in 1990 were short, single-lane, unsurfaced roads. Although initially built for timber sale access, these roads are used both by the Forest Service to manage other resources and by the public. The reconstruction of existing roads primarily accommodated increased traffic and provided for public safety, environmental protection, and reduced travel costs. Work included surface improvements, drainage improvements, flattening of curves, turnouts, erosion protection, and brush removal. The 1990 RPA Program projects a continuing increase in reconstruction needs (6,000 to 7,300 miles per year) over the next 10 years. Forest plans indicate an even greater increase in reconstruction needs. Delays in meeting reconstruction needs will intensify the deterioration of the forest road system and increase users' travel costs.

Forests augmented prudent operator costs for Purchaser built roads with \$1 million of appropriated funds to provide higher quality roads where needed to accommodate recreation and other nontimber traffic. Augmentation provides a low-cost way of meeting recreation traffic needs while minimizing environmental impacts. In 1990, \$5.3 million of appropriated funds were used to survey, appraise, and acquire needed rights-of-way over private lands within or adjacent to the national forests (see "Lands" section for additional information). Figure 44 displays unit costs for construction and reconstruction.

Operations and Maintenance

In 1990, 172,115 miles of road were fully maintained, and 190,931 miles were less than fully maintained (figure 45, table 44). The cost, in terms of appropriated funds, to operate and maintain forest roads to support recreation and forest adminis-



The majority of our transportation system consists of local roads (75 percent). They are normally single-lane, native surface roads that provide for slow-vehicle and limited-vehicle access.

Photo by Randy Wilkerson

trative use was \$96.9 million. Purchasers of Federal timber and other commercial users maintained those roads required for their use—about 42 percent of the total annual maintenance needed. The total maintenance cost from all sources was estimated at \$167 million.

Figure 45.

SUMMARY OF ROAD MAINTENANCE ACCOMPLISHMENTS FOR FY 1990

Type of Traffic	Typical Maintenance Activities	Miles Fully Maintained	Miles Less Than Fully Maintained
Closed to all motorized traffic	Clean drainage courses and culverts	32,727	36,280
Maintained for high-clearance vehicles	Above activity plus brushing, removing downed trees and oversize material, cleanup of minor slumps, signing	84,171	116,781
Maintained for passenger cars	Above activities plus surface blading and ditch cleaning, mowing, gravel replacement, signing	55,217	37,870
		172,115	190,931

Report of the Forest Service

Maintenance activities included both normal and restoration maintenance. Normal maintenance is a standard that maintains a road for current uses and prevents road deterioration. Restoration maintenance returns a deteriorated road to its initially constructed standard. Roads are either fully or less than fully maintained based on whether the road receives normal maintenance. Deferral of normal maintenance reduces levels of service and increases restoration maintenance costs. The current backlog in restoration maintenance is estimated at \$430 million.

Forests increasingly used contract maintenance to improve program flexibility and responsiveness while minimizing fixed costs. National Guard and Reserve engineering units performed road maintenance on forest roads as training exercises. The Forest Service cooperated with State, county, and local road agencies and private landowners to maintain intermixed road systems and to evaluate new road maintenance equipment that may reduce forest road maintenance costs.

The Forest Service receives funds from the Federal Highway Administration (FHWA) for administrative costs associated with the Forest Highway program and for the Emergency Repair of Federally Owned (ERFO) Roads program. In 1990, forests received \$8 million in ERFO road funds through the FHWA, which was used primarily to finance Hurricane Hugo cleanup efforts in the Southeast and Puerto Rico.

Program Cost Control

The Roads Analysis and Display System provides forest managers with unit cost information to identify areas with potential for additional efficiency. It is an effective management tool. Unit costs for road construction, reconstruction, engineering, and administration and support decreased or stabilized over the last 5 years.

In 1990, the Forest Service participated in partnerships and cooperative efforts to reduce the cost of the Forest Service road program and improve public service. For example, the Forest Service participated in the Coordinated Technology Implementation program—a multiagency effort to identify and encourage the application of new technology to agency roads. Typical new technology included nonstandard soil stabilization methods, signing for low-volume roads, and fish passage through culverts.

The agency contracted with the University of Idaho's School of Engineering to better quantify the mix of maintenance and reconstruction dollars to achieve the best balance of both programs. Study results will be published in 1991, and the information will help determine appropriate funding levels.

Bridges

In 1990, the Forest Service constructed 21 new bridges and reconstructed 105 existing bridges. This included 63 con-

structed and reconstructed bridges using timber for the primary structural element. Existing road bridges were maintained, including safety inspections and load-rating determinations. We are sharing with FHWA and the States inspection and inventory data for bridges open to passenger cars.

In 1990, the Forest Service continued to promote the use of timber bridges in rural areas by working with State agencies to identify and construct timber bridge demonstration projects on public roads. The Forest Service published "Timber Bridges—Design, Construction, Inspection and Maintenance," which is available from the Timber Bridge Information Resource Center in Morgantown, West Virginia.

Based on several years of design research by the Forest Service, the American Association of State Highway and Transportation Officials Committee on Bridges approved the design criteria for stressed-timber longitudinal decks for publication as a design guide. Timber bridge research was continued in 1990 on longer spans made of box-girder and Tee-girder sections using local hardwoods. Crash testing also continued on high-performance timber railings attached to timber bridge decks.

ENGINEERING SUPPORT

Facilities Maintained

The Forest Service owns or leases buildings providing approximately 26 million square feet of space. These include lookouts, office buildings, warehouses, employee housing, research laboratories and greenhouses, visitor centers, fire stations, and ground and aircraft fueling and maintenance facilities located on 852 administrative units in 46 States and Puerto Rico. The Forest Service owns the majority of these facilities (78 percent); the remaining facilities are leased through the General Services Administration or private parties. Lease costs for 1990 were approximately \$45 million.



Ranger District Office on the Mt. Hood National Forest with barrier-free access. Photo by Randy Wilkerson

The appropriation for construction of fire, administrative, and other facilities for 1990 was \$6,727,000; the appropriation for construction of research facilities was \$4,408,000. These funds were used to replace functionally or structurally obsolete buildings. Where available and appropriate, Job Corps personnel, prison crews, and volunteers helped construct facilities. In addition to extending federally funded construction, this assistance provided training opportunities for participants.

Current appropriation levels continue to add to the existing backlog of \$448 million in needed facilities construction. The 1990 RPA Program recommends an increase in investments to address the current backlog in safety and health requirements and to provide sufficient facilities for increased public and administrative needs.

The appropriation for maintenance of fire, administration, and other facilities was \$18,893,000 in 1990. In addition, \$5,852,000 in rental collections were used to maintain living quarters and Research program funds were used to maintain research facilities.

The Forest Service has completed initial screenings for radon concentrations in all occupied buildings. Long-term verification testing was completed during 1990, and the mitigation of radon concentrations will be completed during 1991. The agency launched a special initiative in March 1990 to bring all asbestos containing materials under effective management within 5 years.

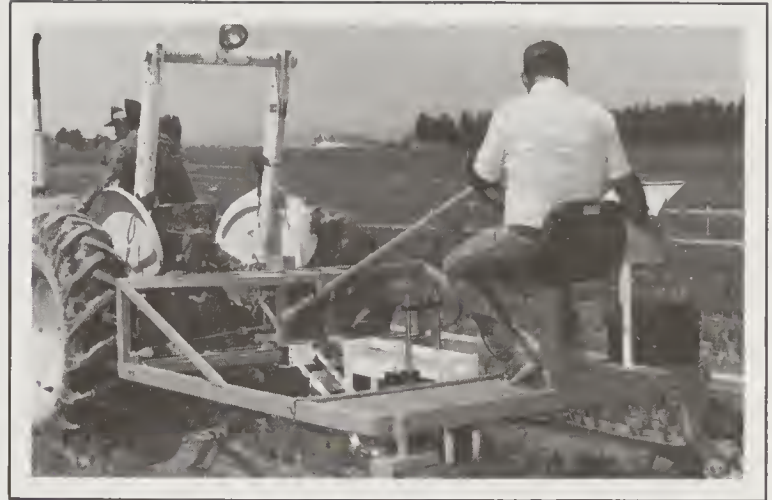
Equipment Management

The Forest Service effectively maintained approximately 16,000 vehicles and 2,000 pieces of specialized equipment. The procurement of new and replacement equipment is funded through the Working Capital Fund and totals approximately \$35.6 million annually. Approximately \$42.6 million is used annually for the safe and cost-effective maintenance of Forest Service vehicles.

In 1990, the Forest Service worked closely with the General Services Administration to improve the truck procurement process for field units. More than 40 new options were added to the existing standard truck procurement contract. Now, 90 percent of the field units can fill orders for medium and heavy trucks within 90 days. The Forest Service was instrumental in developing a new standardized procurement program for wildland fire equipment, ensuring fast availability of equipment for wildland firefighting.

Technology Development

The Technology and Development Centers at Missoula, Montana (MTDC), and San Dimas, California (SDTDC), identify and implement promising new technologies in partnership with Research and National Forest System units, private industry, and other Government agencies. New technologies that im-



Prototype seedling counter, Missoula Technology and Development Center. Photo by Jim Kautz

prove efficiency, reduce costs, and make significant contributions to resource management are transferred to Government and private land managers. Each year, these centers evaluate 70 to 100 developing technologies. The following are selected examples of technologies explored and tested in 1990.

Variable Tire Pressure. A multiyear project demonstrating road construction and maintenance cost savings and reduced environmental effects was continued in 1990. The project included tire and trafficking studies, quantification of road design parameters and environmental effects, and the development of variable tire pressure systems.

Fish Passage Through Culverts. In cooperation with other agencies, SDTDC completed a report, "Fish Passage Through Culverts," which provides broad guidelines for the design, construction, and maintenance of culverts to aid fish passage.

Firefighter Clothing and Equipment. In 1990, MTDC equipment specialists evaluated the effectiveness of protective clothing and forest fire shelters. Results were incorporated into training materials, and a new training guide on shelter deployment was published.

Pollen Collector. MTDC worked with the Pacific Northwest and Southeast Stations to develop mass pollination equipment to improve tree seed quality and quantity.

Report of the Forest Service

Mapping and Remote Sensing

Mapping and Digital Spatial Data. In 1990, the Geometronics Service Center updated 604 Primary Base Series maps and 37 Secondary Base Series maps. The center completed 1,005 cartographic feature files containing digitized information from base series maps. This information will be used to speed future revisions and to provide a base for geographic information systems. The center completed 1,644 digital elevation models and generated 2,131 orthophotos for forest planning and resource management use. A new digitizing and editing system was developed to improve the production of these products.

Remote Sensing. This past year marked the start of the program "Integration of Remote Sensing Into Resource Data Collection for GIS." This program will develop techniques to efficiently use satellite remote sensing data to generate vegetative and other resource layers and to enter these layers into a geographic information system.

The report "Riparian Area Management: What Can Remote Sensing Contribute?" was published. This report defines a set of procedures for classifying and monitoring riparian areas.

A continuing application of remote sensing was the mapping of gypsy moth infestation in the Eastern States. High-altitude, color infrared photographs were taken by equipment flown by NASA aircraft. This photography, acquired in cooperation with State and local agencies, allowed the Forest Service to map large areas of infestation.



Forest Service employee at the Geometronics Service Center uses a large drum plotter to convert map features to digital format, bypassing the manual digitizing process. F.S. Photo



The Geometronics Service Center and the Nationwide Forestry Applications Program are cooperating on a program for integrating remote sensing data from satellites into resource data collection. F.S. Photo





Photo by Bob Nichols



STATE AND PRIVATE FORESTRY

Beyond the Boundaries—Partners in Forestry



INTRODUCTION

The State and Private Forestry program offers technical and financial forestry assistance to State and private forest landowners that helps in protecting and managing the more than 600 million acres of forest land outside the boundaries of the National Forest System. The program serves as the Federal link between many public and private organizations. It bridges ownership and organizational boundaries to promote the wise use of natural resources.

We have strengthened our commitment to multiple-use management by focusing on a multiresource approach to achieve landowner objectives. The Stewardship Initiative, exemplifying multiple-use management, considers all resource uses while emphasizing productive and healthy lands.

Table 45 compares State and Private Forestry 1990 appropriations with long-term projected costs from the 1990 RPA Program, and table 46 displays 1990 appropriations along with 1986-1989 appropriations. Table 47 compares 1990 accomplishments with long-term projections of accomplishments from the 1990 RPA Program.

State and Private Forestry took the lead in developing the Rural Development Strategic Plan, which articulates the Forest Service commitment to rural America—all of the agency's program areas are involved in implementing the plan. The Forest Service is assisting in developing Statewide forest resource plans that provide States with strategic planning direction. We cosponsored resource program planning workshops in the Northeast, South, and West, and emphasized planning coordination between Native American Tribal governments and State and Federal planning.

FIRE AND AVIATION MANAGEMENT

The Forest Service, the largest wildland fire management agency in the Nation, plays a leading role in the training, development, mobilization, and support of wildland fire managers and firefighting personnel throughout the United States and in several foreign countries. In carrying out their respective fire protection responsibilities, Federal, State and local agencies work together and share resources to meet the challenge presented by wildfire emergencies.

Because of abnormally severe weather conditions, more than \$20 million of fire severity funds were needed during 1990 to provide additional fire protection resources, mostly in Montana, Oregon, and Washington. More than \$10 million was spent in California because of the extended drought conditions.

Fire Protection Capability Measurement

State and Private Forestry introduced a new method of evaluating presuppression capability in 1990. The fire organization is compared against an ideal, most efficient level derived from

the National Fire Management Analysis System. The most efficient level represents a fire organization in which presuppression and suppression costs and resource losses are minimized. Regions are expected to have organizations that are consistent with the level of funding allocated by the Washington Office.



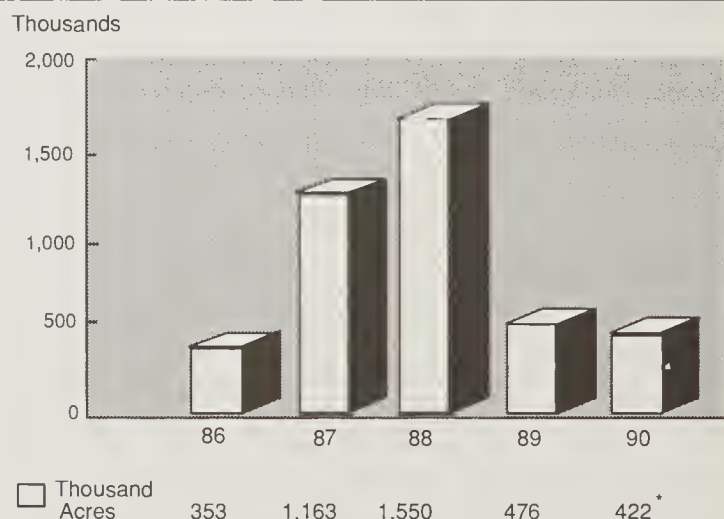
1990 season fireline construction. Photo by Yuen-Gi Yee

Fire Suppression—The 1990 Fire Season

The 1990 fire season was demanding but not as severe as 1987 or 1988. Initial attack resources controlled many fires before they could become large. By September 13, 1990, a total of 10,505 fires burned 421,600 acres of National Forest System land (figure 46). Extreme drought again prevailed over much of the West in 1990. Indeed, Southern California recorded the driest winter in 133 years, following the fifth straight year of drought. Debris left by Hurricane Hugo continued to be a major wildfire threat in the Southeast.

Figure 46.

Acres Burned by Wildfire—National Forest System Lands



In 1990, the National Interagency Coordination Center mobilized more than 10,000 firefighters and support personnel. The center dispatched national incident management teams to 28 incidents, 20 on National Forest System lands. Another 14 area teams were mobilized to incidents outside of their geographic area. Three battalions of military troops and four Canadian airtankers were mobilized. Fifty-three crews from 25 States were dispatched, and 269 personnel from 30 States filled overhead and support positions.

In late June, several lightning storms started fires in the Southwest and Rocky Mountain areas. Initial attack by local crews, 31 airtankers (including 3 Canadian airtankers), and more than 100 smokejumpers contained most fires. Despite aggressive initial attack, several large fires developed in Arizona, New Mexico, and Colorado as record heat and numerous dry lightning storms contributed to intense fires. One hundred sixty crews from other geographic areas and agencies responded to help crews in the Rocky Mountains and Southwest.

On June 26, a firefighting crew from the Arizona Prison System was overrun on the Dude Fire, Tonto National Forest, resulting in six fatalities. One day later, two California Department of Forestry firefighters lost their lives when they were entrapped by fire on the California Fire near Riverside, California.



Urban/wildland interface, Dude Fire.

Photo by Yuen-Gi Yee

The Paint Fire near Santa Barbara, California, which burned 280 homes in 3 hours required the activation of eight C-130 military aircraft fitted with Modular Airborne Fire Fighting Systems. These aircraft supported the regular airtanker fleet.

In July and September, two large fires in the Okefenokee Wildlife Refuge required the use of national incident management teams.

Alaska's fire season began with lightning storms in late July. Two national incident management teams, 36 hotshot crews, 6 airtankers (including 1 from Canada), 150 smokejumpers, and

several hundred fire overhead personnel traveled from the "lower 48" to help.

Hot and dry weather continued into August. The Aubrey Hall Fire located near Bend, Oregon, burned 28 homes and threatened 2,000 more homes and a large resort.



C23A Serpa will be used to deliver smokejumpers.

Photo by Short Brothers

Hotline

The Hotline Fire Information Center, started in 1988 as a public service, provides current and accurate information from national television networks, wire services, professional journals, magazines, and several major newspapers.

Fuel Management

During 1990, the Forest Service reduced the fuel hazard of naturally occurring fuels on 304,902 acres (figure 47) while

Figure 47.

Acres of Fuels Treatment Accomplished—National Forest System Lands

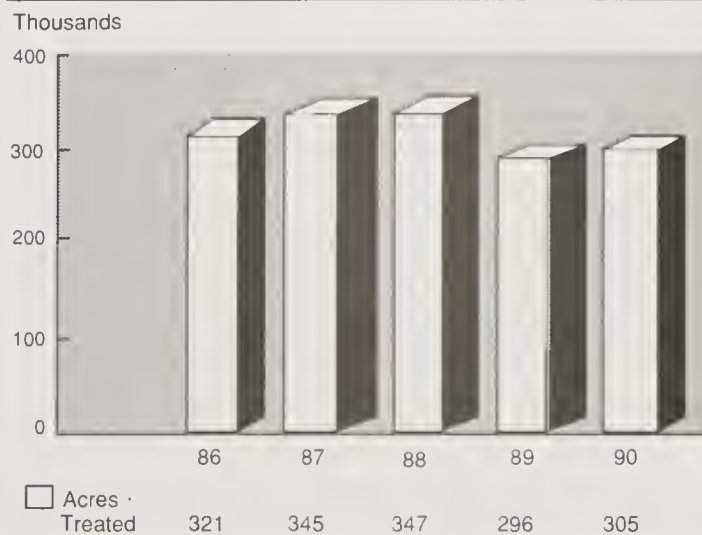
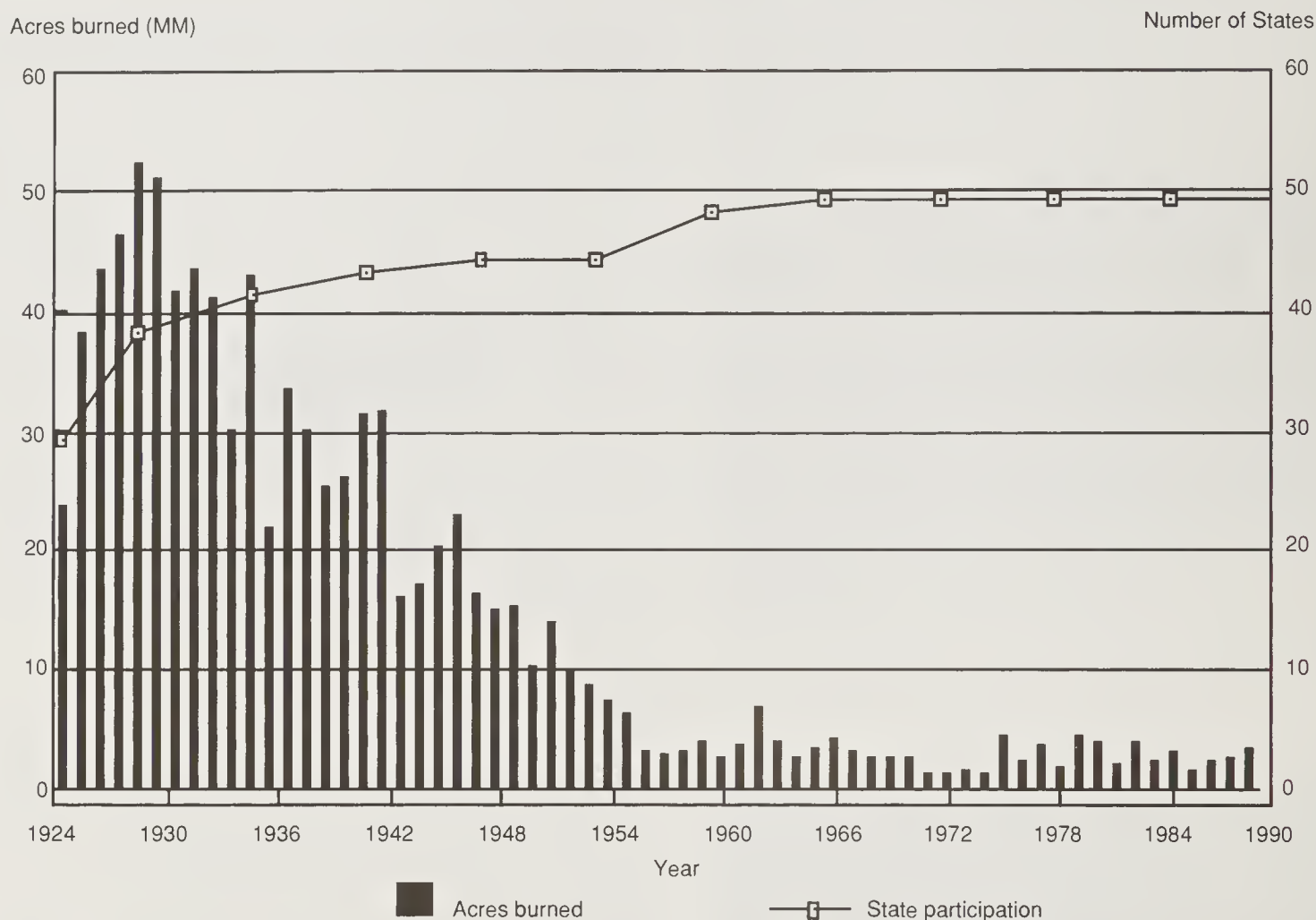


Figure 48.
State and Private Acres Burned Compared With State Participation in Cooperative Fire Protection Programs



volunteer and other contributed work reduced the hazards on another 612 acres. Figure 48 displays acreage of State and private lands burned compared to State participation in Cooperative Fire Protection programs. Table 11 illustrates fuel treatment accomplishments by Forest Service regions.

National Advanced Resource Technology Center

The National Advanced Resource Technology Center sponsors national-level training courses and provides resources and services for course development. Personnel from Federal agencies, States, and other countries use the center. Canada, India, Mexico, Brazil, and Indonesia received benefits in 1990. The center conducted 11 fire training courses serving 305 Forest Service employees, 65 State employees, 102 people from other Federal agencies, and 24 people from Canada.

International Cooperation

Fire and Aviation Management shared new information and technology with 7 countries during 1990: Mexico, Chile, Brazil,

Costa Rica, the Soviet Union, Israel, and Canada. Training course development, specialized equipment transfer, the loaning of equipment, training assignments on fires, and program development consultation are a few examples of international cooperative activities.

Cooperative Fire Protection

Cooperative Fire Protection, composed of the Rural Community Fire Protection and Rural Fire Prevention and Control Programs, improves the efficiency and effectiveness of State and local firefighting agencies by providing matching funds for equipment, training, information gathering and distribution, technology transfer, and technical assistance and coordination. The number of burned acres of State and private lands has been significantly reduced as a result of these programs (figure 48, table 48).



Excess property "before" (military 1-1/4-ton cargo truck).
Photo by U.S. Army



Excess property "after" (300-gallon engine).
Photo by Florida Division of Forestry.

Federal Excess Personal Property

The Federal Excess Personal Property Program is a component of the Rural Fire Prevention and Control Program. Through this program, the Federal Government loans various types of property to State and local firefighting organizations. Over 16,000 vehicles, including 24 Bell UH-1 helicopters and 144 gamma goat cargo vehicles were classified as Federal Excess Property in 1990, and are on loan to the States.

The Urban/Wildland Fire Protection Initiative

As part of the Urban/Wildland Fire Protection Initiative, in the summer of 1990, the Forest Service was host to a half hour viewer call-in program on Cable News Network. The discussion

focused on measures homeowners can take to protect their homes from wildland fire. The program provided advice about roofing, fire-safe building materials, and clearing around forest homes. A new video has been produced to assist field personnel in making real-time decisions about safely and effectively protecting structures.

Smokey Bear Fire Prevention Program

The Forest Service provides printed items and other prevention materials to field units and States. In 1990, the value of these materials was \$1,067,000. States purchased approximately 50 percent of these materials.

Federal Disaster Assistance

Cooperative Fire Protection also provides technical assistance at natural disasters. In 1990, support personnel were provided for the San Francisco Bay Area earthquake disaster teams and for teams dealing with the localized flooding in the Southeastern Region. The Forest Service and the Federal Emergency Management Agency provided expertise in developing fuel management strategies, presuppression planning, and prevention programs in the wake of Hurricane Hugo.

Rural Community Fire Protection

The Farmers Home Administration funds Rural Community Fire Protection, and the Forest Service administers the program in cooperation with State foresters. This program contributes matching funds to strengthen volunteer fire departments in communities of less than 10,000 people. The funds provide for organizing, training, and equipping rural fire departments. Of the \$3,091,000 granted in 1990, cooperators used 76 percent for radio and other equipment purchases, 16 percent for training, and 8 percent for administration and overhead. State Foresters approved about 3,400 applications for projects funded.



Smokey. F.S. Photo

FOREST PEST MANAGEMENT

Forest Pest Management provides protection from insects and diseases on all Federal and non-Federal lands. The direct value of timber saved by pest management prevention and suppression project activities on all lands in 1990 is estimated at \$160 million. Pest management projects also helped protect recreation areas, wildlife habitats, and watersheds.

National total program expenditures were \$65 million—\$43 million in Federal funds and \$22 million in State funds. Federal funds supported all program and suppression activities on Federal lands, plus 21 percent of program activities and 47 percent of suppression activities on State and private lands. State cooperator funds supported the balance of cooperative program and suppression activities.

Surveys and Technical Assistance

The Forest Service aerial and ground surveys detected and evaluated vegetation damage or pest populations on 134 million acres of National Forest System lands and 44 million acres of other Federal lands. With Forest Service assistance, State forestry organizations similarly surveyed 417 million acres of State and private lands. Survey findings, along with recommendations and advice about suppression needs and available alternatives, were provided to the managers of affected lands.

The Forest Service is implementing forest health plan guidelines that emphasize managing forests to reduce susceptibility to pest outbreaks rather than relying on suppression measures. The guidelines include a nationwide forest health monitoring system to detect and report unusual changes in forest conditions and to determine causal relationships sufficiently to develop management actions to protect the Nation's forest resources. Forest Health Monitoring is a cooperative program among the Forest Service, States, and the U.S. Environmental Protection Agency.

In 1990, we concentrated on installing the forest health monitoring detection system in New England and on measuring the condition of northeastern sugar maple and spruce-fir forests. We also field-tested specialized forest health monitoring techniques.

Pest Outbreak Prevention and Suppression

Pest suppression projects protected an estimated 1,853 million cubic feet of merchantable timber on all lands. In addition, we salvaged an estimated 10 million cubic feet of insect-infested timber.

The gypsy moth continues to reappear in the generally infested area and spread into new areas. Federal managers conducted suppression projects on 7,700 acres of National Forest System lands in Michigan, Virginia, Vermont, and West Virginia and on 21,700 acres of other Federal lands in Maryland, New York,



Gypsy moth trap. F.S. Photo

Pennsylvania, Virginia, and Washington, D.C. The Forest Service also helped State agencies with projects on 1,253,700 acres of State and private lands in Delaware, Maryland, Michigan, New Jersey, Pennsylvania, Vermont, Virginia, and West Virginia—an increase of 508,800 acres above the 744,900 acres treated in 1989.

The Forest Service conducts or participates in eradication projects to prevent the gypsy moth from becoming established in new areas. In 1990, 6,360 acres were treated in Idaho, 4,000 acres in North Carolina, and 20,100 acres in Utah. All infestations were treated with two or three applications of *Bacillus thuringiensis*, a bacterial insecticide. Tennessee had 200 acres treated with GYPCHEK, a virus. Even though trap counts and egg mass surveys are incomplete, and statements about effectiveness are thus premature, early indications are that some of the urban areas may not need retreatment next year.

We performed southern pine beetle suppression activities—such as salvaging infected areas, cut-and-leave harvesting,



Aerial application of gypsy moth spray in Utah. F.S. Photo

and piling and burning infected logging slash—on approximately 3,200 acres of National Forest System lands and assisted other Federal managers on 212 acres of other Federal lands. We also helped State managers on 950 acres of State and private lands. Suppression activities protected about 10.5 million cubic feet and salvaged an additional 5.2 million cubic feet of pine timber.

Populations of the southern pine beetle and the pine engraver beetle (another bark beetle) increased in the timber downed and damaged by Hurricane Hugo in September 1989. Forest Pest Management staff provided Federal, State, and private land managers with aerial photography coverage of 11 million acres of damage area and pest outbreak evaluations for use in planning salvage operations.

The only major western spruce budworm suppression project covered 65,875 acres on the Yakima Indian Reservation and 5,000 acres of intermingled and adjacent State and private lands in Washington. The project protected about 3.5 million cubic feet of merchantable timber and also protected wildlife, recreation, and watershed values by preventing further defoliation, treetop killing, and tree mortality. No retreatment is required.

Mountain pine beetle suppression occurred on 79,600 acres of National Forest System lands, 3,830 acres of other Federal lands, and 8,400 acres of State and private lands. Approximately 8.8 million cubic feet of timber were protected, and an additional 3.6 million cubic feet of timber were salvaged.

Populations of other bark beetles, including the Douglas-fir beetle, the western pine beetle, engraver beetles, and the spruce beetle, were severe in drought-stricken trees in California. Forest Pest Management provided land managers with aerial photography coverage of 8.5 million acres of damaged trees. The photography and pest outbreak evaluations helped land managers plan their management activities, including the salvage of 149 million cubic feet of timber that had been killed by drought or bark beetles.

Pesticide Use

In 1990, 333,588 acres, less than 1 percent of the total acreage of the national forests and grasslands, were treated with pesticides (figure 49). Treatments included 109,756 acres for insect and disease prevention and suppression, 95,571 acres for vegetation management, and 128,261 acres for animal control and other minor uses (table 49).

Pest Management Special Projects

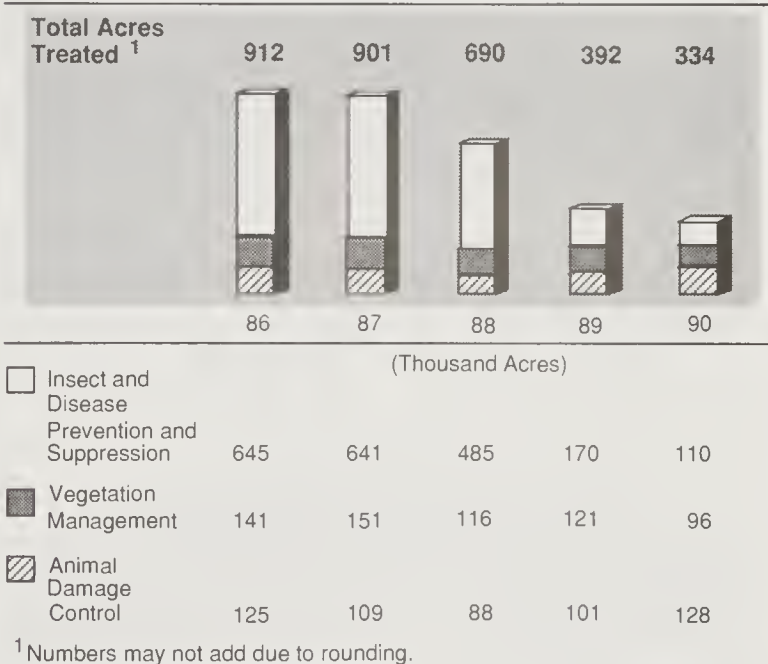
The Appalachian Gypsy Moth Integrated Pest Management Demonstration Project is a multiyear, multiagency project that shows that the spread of gypsy moth can be slowed and the negative effects reduced in infested areas. In 1990, about 270,000 acres were treated. The insect growth regulator

Dimilin (diflubenzuron), the bacterial insecticide, *Bacillus thuringiensis*, and the virus GYPCHEK were used.

Evaluations were continued on the ability of GYPCHEK, as well as aerially applied pheromone-impregnated flakes, to eradicate

Figure 49.

Pesticide Use on National Forest System Lands



isolated gypsy moth infestations. Results were encouraging, and we will pilot test the pheromone flakes. Evaluations of the impacts of Dimilin and *Bacillus thuringiensis* on nontarget organisms and determinations of the residual life of Dimilin were continued.

Other studies evaluated various dose rates of *Bacillus thuringiensis* and GYPCHEK, reduced dose rates of Dimilin, and the efficacy of introducing substerile males into low-level populations. *Bacillus thuringiensis* is recommended for use at a lower dose rate to protect foliage and reduce gypsy moth populations. GYPCHEK seems to be as effective as either Dimilin or *Bacillus thuringiensis* against moderate to high gypsy moth populations. Additional studies are planned on reduced dose rates for Dimilin and on introducing substerile males.

A sequential sampling system developed for gypsy moth egg-mass surveys has proven to be as rapid and cost-efficient as existing systems and more accurate

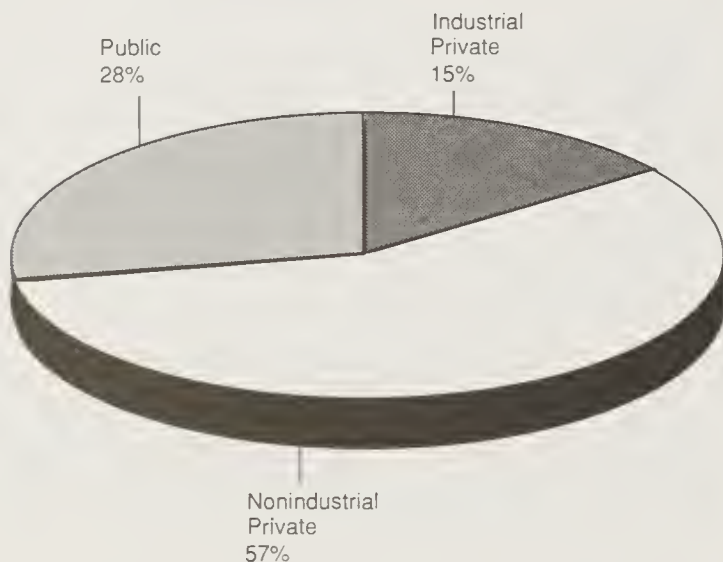
The Forest Service continued participation in the National Agricultural Pesticide Impact Assessment Program. In 1990, 21 projects were designed to improve our knowledge of the benefits and risks of using pesticides in forestry. Most studies concentrated on the fate of pesticides in the environment.

FOREST MANAGEMENT AND UTILIZATION

Forest Resource Management

The Forest Resource Management program cooperates with State forestry agencies to provide technical assistance to non-industrial private landowners for managing their forest lands (tables 50-52). Figure 50 displays timberlands by percent ownership. During 1990, this program helped landowners manage 3.5 million acres by assistance through multiresource management plans. The 1990 RPA Program projects a 157-percent increase in multiresource management plan acres by 1995, with a 237-percent increase (base year 1990) projected toward 2040.

Figure 50.
Timberlands by Ownership



The Forest Resource Management program helped plant trees on 1.1 million acres. The 1990 RPA Program projects a 47-percent increase in planting acres by 1995, with planting levels projected to drop 10 percent (base year 1990) toward 2040. The program accomplished timber stand improvement on 186,759 acres. The 1990 RPA Program projects a 365-percent (base year 1990) increase in timber stand improvement acres by 1995, with a 435-percent increase (base year 1990) projected toward 2040.

Forest Stewardship

The Forest Stewardship program applies environmental and economic resource principles to forest resources and lands to benefit landowners and the public. The Forest Stewardship program received major congressional emphasis with the 1990 Farm Bill's Forestry Title, the "Forest Stewardship Act of 1990." This legislation amends and strengthens the Cooperative Forestry Assistance Act of 1978; the Forestry Title appears for the



Measuring road drainage during the National Watershed Workshop at Fernow Experimental Forest in West Virginia. F.S. Photo

first time and will serve as a guideline shaping Cooperative Forestry programs into the 21st century.

The Conservation Title of the Farm Bill increases emphasis on tree planting, particularly in the Great Plains area, on marginal pastureland, and along streamside zones. There are extensive incentives to plant hardwood trees. The President's America the Beautiful initiative to expand tree planting and tree improvement had a major influence on the legislation.

Accomplishments in 1990 include:

- Completion by every State of a State-level Forest Stewardship Plan.
- Provision of comprehensive resource assistance to nonindustrial private forest landowners, resulting in multiple benefits contributing to clean water and air, healthy fish and wildlife, quality outdoor recreation, and continuous supplies of forest products.
- Expansion and improvement of assistance to landowners.
- Focus by State stewardship coordinating committees on partnerships and a shared funding approach for multiresource management practices.

Rural Development Strategic Plan

In December 1989, Chief Robertson established the National Rural Development Task Force to prepare a plan for the Forest Service that articulates the agency's commitment to rural America. At the same time, the Rural Development Steering Committee was formed to ensure agencywide coordination and communication. The task force completed its review of Forest Service efforts, developed a strategic plan, and revised rural development policy.

"A Strategic Plan for the 90's: Working Together for Rural America" emphasizes working with rural communities in developing natural-resource-based opportunities that solve local problems. The plan focuses future Forest Service rural development efforts on the President's long-term rural goals, Department of Agriculture rural development responsibilities, and the Forest Service mission.

Taxation

The Forest Service provides taxation information to forest landowners. In 1990, Agricultural Handbook 681, "Forest Owners' Guide to Timber Investments, the Federal Income Tax and Tax Recordkeeping" was reprinted and distributed. Forest Service tax coordinators wrote articles for forestry magazines and conducted or participated in numerous forest taxation meetings, especially in the North and Northeast. A 1-page publication, "Tax Tips for Forestry Landowners," was developed for forest landowners in the Southeast.

Utilization, Marketing, and Technology Transfer

Utilization, marketing, and technology transfer activities are important aspects of the outreach and delivery provided by the Cooperative Forestry staff. Key 1990 accomplishments were as follows:

- The monthly technology transfer newsletter "Utilization & Marketing Review" provides current information on research and technology transfer to assist scientists and nonindustrial private landowners.
- The "Technology Opportunities" packet contains concepts, emerging technologies, recent developments, and state-of-the-art knowledge from the Forest Products Laboratory and experiment stations. The packet was distributed agencywide and to approximately 1,000 organizations and individuals.
- A total of 714 Integrated Mill Production and Recovery Options for Value and Efficiency (IMPROVE) System packages were distributed to 29 States and 10 foreign countries. IMPROVE will increase sawmill, veneer mill, or plywood plant output by improving manufacturing efficiency.

- A spreadsheet-based microcomputer program, MicroSIP-3, was released in April 1990 to help sawmill owners and operators analyze their sawmill operations.
- The Forest Industry Data System, a compatible data entry system for forest industry databases, was used by 37 States. The system established compatibility and promoted national exchange of forest industry data.
- A first-of-its-kind workshop promoted the variety of special products forests have to offer, including information about production, management, and use. A 22-page background paper identifying 26 categories of the lesser known forest products, "Rural Development Opportunities in Special Forest Products," was prepared.
- The transfer of technologies to the private sector was emphasized. Technologies included central tire inflation, wood protection using diffusible preservatives, and hardwood use for structural application.



The IMPROVE System is a cooperative effort of State and Private Forestry staff and researchers. Quality starts at the stump and follows through to the finished product. F.S. Photo



1990 Earth Day, April 19th, celebration and tree planting at the Department of Agriculture with Secretary and Mrs. Yeutter, Chief F. Dale Robertson, and Presidents from four 1890 Land Grant Colleges and Universities. Photo by Karl Perry

Statewide Forest Resource Planning

The statewide forest resource planning program received \$850,000 in 1990. Combined with State dollars, this money sponsored workshops in all three of the Nation's planning regions, helped States produce publications and complete economic studies, and supported State planning staffs. Highlights in 1990 were the establishment of the Western Forest Resource Planners Association by the Council of Western State Foresters and a western strategic planning workshop cosponsored by the Forest Service.

Cooperative Forestry staff developed and implemented a strategy to improve planning coordination between Native American tribal governments and the Forest Service. Landmark achievements included the establishment of a relationship with the Hopi Tribe and the participation of tribal representatives in western and northeastern planning conferences.

Seedlings, Nurseries, and Tree Improvement

This cooperative Federal-State program upgrades the quality of nursery operations and seedlings and improves the productivity and quality of non-Federal forests. The program provides technical expertise to increase seedling survival, shorten forest rotation lengths, augment species resistance to disease and insects, and improve tree form and wood quality.

In 1990, an estimated 1.9 billion tree seedlings were produced and planted on approximately 2.86 million acres nationwide. Approximately 45 percent of these seedlings (850 million) were planted on 1.29 million acres of non-Federal public (State and local) and nonindustrial private lands. About 85 percent of 850 million seedlings were planted on private lands, primarily in the South. Approximately 44 percent of the acres planted on private lands occurred on industry lands.

Various Department of Agriculture incentive programs—Conservation Reserve Program, Forestry Incentives Program, and Agricultural Conservation Program—continued to support tree planting efforts. State and Private Forestry staff ensured that these programs resulted in successful reforestation efforts. In 1990, no new lands were enrolled into the Conservation Reserve Program.

With State and Private Forestry technical and financial assistance, State nurseries produced large numbers of high-quality, genetically improved tree seedlings. Genetic nursery stock results in 10 percent more wood fiber, better wood quality, and better resistance to insects and diseases.

More than 90 percent of all planting stock produced in southern State nurseries are now genetically improved. In 1990, the 87 State forest nurseries, previously developed with Federal and State support, produced approximately 30 percent of the total

seedling production in the United States and were the primary source of tree seedlings for nonindustrial forest landowners.

Urban and Community Forestry

The Urban and Community Forestry program promotes and improves the economic, environmental, and social well-being of communities through the planting and management of trees, shrubs, and other vegetation. These efforts enhance the city environment, make important contributions to soil, water, and air quality, and help conserve energy and reduce atmospheric carbon dioxide.

In 1990, financial assistance provided to the States to conduct urban and community forestry activities was about \$1.4 million. State Foresters used these funds to provide technical assistance to 7,964 communities (8,763 contacts), representing more than 75 million people. Joint State, local, and Federal cooperation resulted in the following program accomplishments:

- Three new special-interest groups were included in 1990 outreach efforts: the National Conference of Black Mayors, the Chinese American Forum, and the National Council of La Raza (Hispanic). Major efforts were made to maintain partnership with the Congressional Black Caucus, the National Urban League, and the National Association for the Advancement of Colored People.
- The National Grove of State Trees was officially dedicated at the U.S. National Arboretum in the District of Columbia.
- Cooperative Forestry and the National Association of State Foresters sponsored a congressional tree-planting ceremony on April 5, 1990, to commemorate National Arbor Day.
- Cooperative Forestry, the Human Resource Programs, and the International Society of Arboriculture, using the Job Corps program, formed a partnership to develop a tree and lawn care intern-technician program for disadvantaged youth.
- The National Association of State Foresters, the National Arbor Day Foundation, and Cooperative Forestry sponsored the "Tree City USA" program. Over 1,220 awards were presented to communities for their commitment to tree planting and care. The District of Columbia won its third consecutive Tree City USA award.
- Planning for the National Arbor Day Foundation's congressionally sponsored Information and Education Center in Nebraska City, NE, was completed with groundbreaking to begin in early spring 1991.
- Cooperative Forestry produced and assisted in producing several urban forestry publications and five new exhibits for public and professional use.



Mrs. Yeutter, wife of Secretary of Agriculture Clayton Yeutter, plants the first tree at the National Grove of State Trees.

Photo by Karl Perry

Forestry Incentives

The Forestry Incentives Program and the forestry component of the Agricultural Conservation Program are important cost-share programs promoting forestry on nonindustrial private forest lands. Both programs are administered by the Agricultural Stabilization and Conservation Service, with technical responsibility for forestry activities assigned to the Forest Service and State foresters. Together, these programs account for approximately 25 percent of all reforestation on nonindustrial private forest lands. In 1990, reforestation under the two programs totaled 161,000 acres and 144,000 acres, respectively. In 1990, timber stand improvement activities for the Forestry Incentives Program totaled 30,000 acres; for the Agricultural Conservation Program, acres totaled 39,000.

Cooperative Watershed Activities

The Forest Service cooperates with the Soil Conservation Service in several USDA watershed projects. The Forest Service provided expertise and information in 49 river basin studies and 66 watershed planning projects as part of the Public Law 83-566 Watershed Program (table 53). Through this program, State forestry organizations provided technical assistance for land treatment on 11,064 acres. Opportunities were targeted to improve soil and water resources and to implement actions on a priority basis. For example, the Chicksaw and Hatchie River Basin Study resulted in the Tennessee Division of Forestry adding a staff position to increase technical assistance on nonpoint pollution control.

Report of the Forest Service

During 1990, Public Law 78-534 Flood Prevention Projects in California, Texas, Oklahoma, Virginia, Maryland, and West Virginia, with watershed conditions improved on 5,615 acres (table 54).

The Emergency Watershed Protection Program (Public Law 95-334) provides assistance to reduce threats to life and property following natural disasters. The Forest Service and the Soil Conservation Service provided technical and financial assistance on both public and private lands. During 1990, much of the assistance focused on damage from Hurricane Hugo in Puerto Rico and South Carolina. Critical channel segments were cleared at municipal water supply intakes and at road crossings on National Forest System lands.

Resource Conservation and Development

The Forest Service is responsible for forestry activities in the Resource Conservation and Development Program, administered by the Soil Conservation Service. In 1990, funds were cost-shared (80 percent Federal, 20 percent States) with 30 State forestry organizations provided technical assistance to improve economic, social, and environmental conditions in rural resource conservation and development areas. Accomplishments in 1990 included the support of 17 workshops in North Dakota to familiarize local employees with urban forestry tools, the sponsorship of forestry judging contests with Future Farmers of America and 4-H'ers in Oklahoma, and a timber bridge workshop promoting the use of native species as a low-cost alternative to replace deficient rural bridges in Minnesota.

SPECIAL PROJECTS

Hurricane Hugo

State and Private Forestry has the Forest Service lead for responding to disasters, such as Hurricane Hugo. Forest lands in South Carolina, North Carolina, Virginia, Puerto Rico, and the Virgin Islands were heavily affected in late 1989. In 1990, nearly \$34 million was provided in disaster assistance with more than \$9 million of the total for State and private lands. Highlights of accomplishments follow.

The Francis Marion National Forest in South Carolina implemented a massive program involving prevention, presuppression, fuel reduction and modification, and wildfire suppression. Approximately 208 miles of fuel break was constructed and 5,757 acres treated to reduce fire occurrence or spread. A cooperative fire prevention campaign occurred in partnership with the State involving media communications and more than 6,000 personal contacts by Forest Service employees. Suppression action was taken on 72 fires. Quick detection and aggressive responses resulted in all fires being controlled during initial attack.

Approximately 470 million board feet (MMBF) of damaged timber was offered for sale in 1990. The Francis Marion



Oklahoma Service Foresters provide technical assistance to landowners on Washita Flood Prevention Project.

Photo by Gordon Stewart

National Forest, alone, offered 449 MMBF, sold 328 MMBF, and harvested 255 MMBF. Logging was modified to protect remaining live trees and to reduce impact on environmentally sensitive areas.

Reforestation on the Francis Marion National Forest included 2,786 acres of site preparation and 1,599 acres of planting. Timber stand improvement was accomplished on 1,253 acres.

Wildlife and fish habitat was severely affected by the hurricane. Of special concern was the impact on two endangered species: the Puerto Rican parrot on the Caribbean National Forest, and the red-cockaded woodpecker on the Francis Marion National Forest. Substantial work was performed, including construction or repair of nests, lookout towers, artificial cavities, and blinds. Nesting and reproduction surveys were made on all active colonies.

Burton-Santini Act

Under the Burton-Santini Act (Public Law 96-586), the Secretary of Agriculture granted \$1.4 million to four counties and towns in the Lake Tahoe Basin to reduce soil erosion and water pollution. Funds were matched by \$5.6 million in State and local funding. The Burton-Santi projects in 1990 reduced sedimentation in Lake Tahoe by more than 2,600 tons.

Because of the high elevation, short growing season, and soil conditions, the Lake Tahoe erosion control program uses innovative measures that attract worldwide interest. During 1990, visitors included Soil Conservation Service State engineers, Soil and Water Conservation Society members, and foresters and scientists from Chile, Taiwan, Japan, and the Lake Baikal region in the Soviet Union.

Economic Diversification Grant Programs

In 1990, Congress appropriated \$495,000 for Economic Diversification Grant programs to help rural communities dependent on forest resources or threatened by reductions in raw materials from national forests or other ownerships. Ten projects developed from these program funds were cost-shared with local and State governments in nine States: Alaska, California, Colorado, Idaho, Louisiana, Montana, New Mexico, Oregon, and Washington.

For example, in Beaverhead County, MT, the Beaverhead Development Corporation studied alternatives to timber harvesting, primary wood processing, and the exporting of raw materials. In California, the Plumas Corporation and the Plumas County Community Development Commission jointly assessed opportunities and marketing methods to attract new industries to the county's three airport areas. In Louisiana, Winn Parish identified ways to attract value-added industries, retirees, and growers of specialty crops.

Rural Development Initiative

In 1990, for the first time, Congress appropriated \$2.5 million for Forest Service-local sponsor cost-sharing to encourage diversified and expanded use of forest resources, especially in communities within or near national forests; \$1.4 million of the \$2.5 million appropriation was allocated to the Northeastern Area for rural development. This included \$355,000 for demonstration projects in Missouri, Vermont, and West Virginia. Missouri organized a catalog of development programs available to forest-based enterprises; Vermont conducted a survey of waste wood production and developed alternate disposal methods; and West Virginia established a central forest resource information center with six regional centers.

The Southern Region received \$425,000 and cost-shared 22 projects throughout the South. Collectively, the seven western Regions were allocated \$385,000 to cost-share 10 projects in nine States. Funds were also used to help establish a World Forestry Center in Portland, OR.

Timber Bridge Initiative

Congress appropriated \$2.7 million in 1990 to continue the Timber Bridge Initiative. The Forest Service cost-shared construction of 49 bridges with modern timber designs in 27 States, cosponsored 9 timber bridge workshops and seminars for State and local government administrators and engineers, and produced several brochures and other visual aids promoting this technology.

The Pinchot Institute for Conservation Studies

The Pinchot Institute for Conservation Studies, in Milford, PA, serves as a center for discussing natural resource issues of

national and regional importance. It seeks solutions in the preconflict stage, provides information for increasing awareness about natural resource conservation, interprets land use and conservation in America, interprets the history of the Pinchot family's contribution to conservation in the context of these themes, and provides continuous stewardship for the historic landmark.

During 1990, the Pinchot Institute, continuing its Conservation Seminar Series in cooperation with the Society of American Foresters and the College of Environmental Studies and Forestry, University of New York at Syracuse, sponsored a lands conference to discuss loss of open space and forest resources in urban-rural interfaces in the Northeast. Participants explored the policy alternatives that might be available to State, local, and Federal governments as economic, social, and natural values may change in the future.

The Fourth Pinchot Lecture and Scholars' Roundtable was held at Grey Towers to promote awareness of forest conservation history and heritage. Presentations included the Forest Reserves Centennial and the Pinchot Papers Project at the Library of Congress.

Northern Forest Lands Study

In 1988, Congress directed the Forest Service to study the effects of ownership and management changes of large tracts of forested land in northern New England and New York. The Governors of four States (Maine, New Hampshire, Vermont, and New York) set up a task force to work with the Forest Service on the study. A final report, released in May 1990, identified and assessed the forest resources, landownership patterns, social and economic changes, and strategies necessary to meet an agreed-on future vision. As directed by Congress, the report made no recommendations. The Northern Forest Lands Council was established to work with the task force for 4 years to keep land open and productive.

Tropical Forestry Initiative

In 1990, Congress appropriated \$2.5 million to State and Private Forestry to work with resource managers in tropical countries to improve forest management and conservation. Funds were for training, technical assistance, and support to international organizations. The initiative contributed to 80 projects or activities worldwide, involving many Forest Service staff, State agencies, universities, development agencies, and private organizations. We trained more than 600 people in 25 developing countries and cooperated with more than 70 organizations. We participated in projects of special interest, such as the global assessment of the world's tropical forests (working with the United Nations' Food and Agriculture Organization).

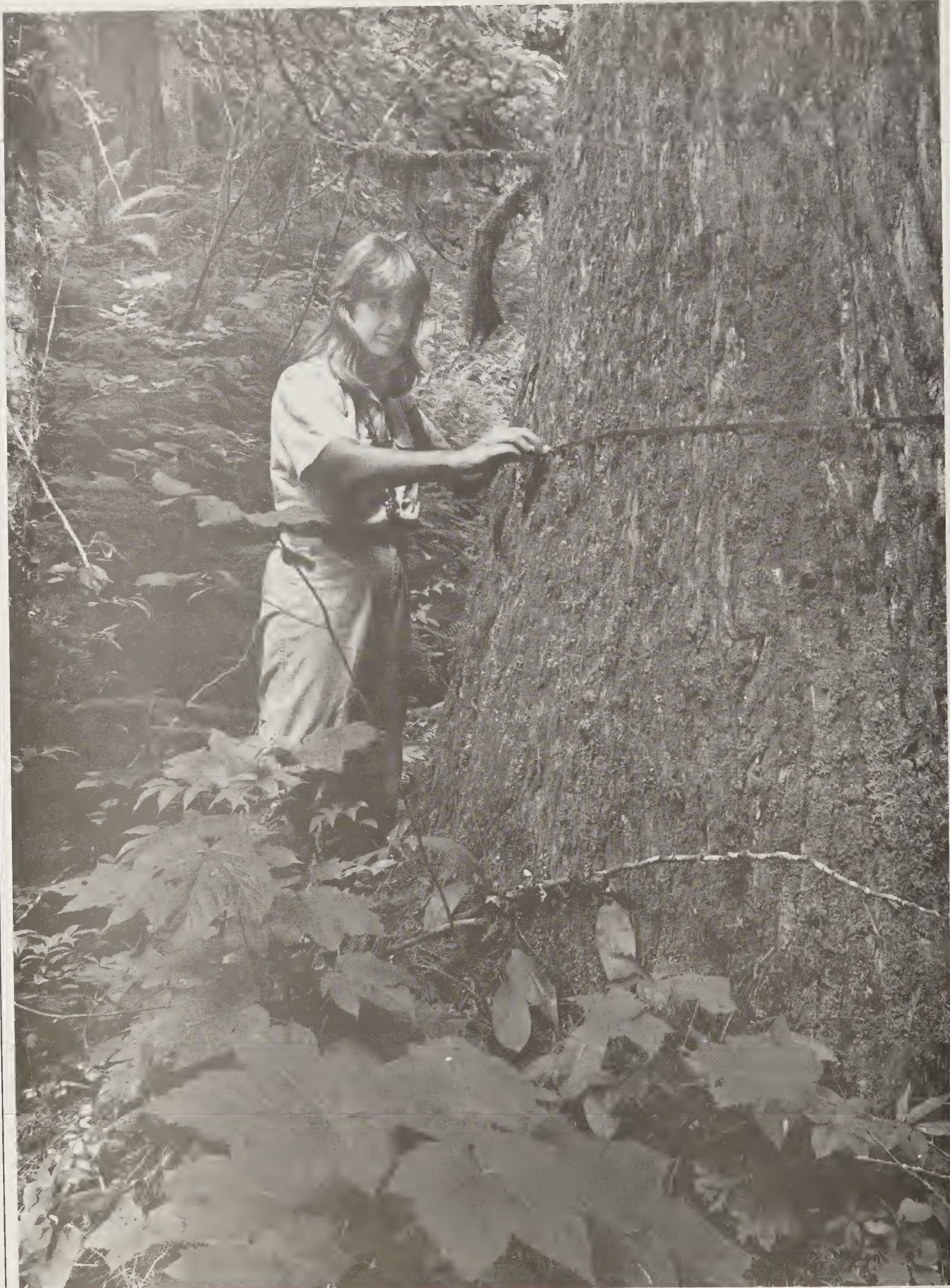


Photo by Dave Tippetts



FOREST RESEARCH

Advancing Knowledge for Society's Needs



THE RESEARCH MISSION

The Forest Service conducts the most extensive program of integrated forestry research in the world. The program improves resource productivity, reduces costs, enhances the effectiveness of forest management, and protects or improves environmental quality on America's 1.6 billion acres of forests and associated rangelands.

Two national strategic plans that provide guidance were completed in 1990: the 1990 RPA Program and Strategy for the '90's for USDA Forest Service Research. The RPA Program called "sound resource management, technological advances, and new scientific information . . . essential to meeting current and future resource needs." Of the four major themes in the RPA Program, two pertain to research: Improve scientific knowledge about natural resources; and respond to global resource issues. The Strategy for the '90's builds on user needs, agency and research mission statements, and organizational strengths to guide selection of topics needing increased emphasis. The research stations and the Forest Products Laboratory are preparing their own strategic plans, tiered to national strategic plans.

In 1990, appropriations for Forest Service Research, including supplemental funding totaled approximately \$151 million, of which 9 percent (\$13 million) supported cooperative studies with colleges, universities, other research organizations, and industry (tables 55 through 57). Supplemental research support (approximately \$6 million) was received from other Government agencies and from various private sector institutions.

Under the Research Challenge Cost-Share Program, 25 non-Federal cooperators contributed \$600,500 for 15 projects of mutual concern. The program expanded forestry research into areas benefiting non-Federal clients. Studies were conducted on wildlife, fisheries, nursery diseases, water quality, tree planting, tree genetics, insect control, heat islands, and recycling.

The eight regional experiment stations and the national Forest Products Laboratory conduct more than 2,800 studies at any one time, involving approximately 714 Forest Service scientists at 74 locations throughout the world. Forest Service scientists work with researchers from other public agencies, universities and colleges, and the forest industry. Research results are disseminated through publications (table 58), symposiums, workshops, and direct contacts.

Forest Service research conducts work in five broad areas: forest protection, resource analysis, forest management, forest environment, and forest products and harvesting. Long-term research in these areas provide the foundation of Forest Service research. Additional accelerated research in these five broad areas is conducted on critical resource issues and comprises the National Problems program area.

Research program accomplishments follow for six National Problems, the Foundation Research Program and International Forestry. These following examples address the 1990 RPA Program emphases, including contributions relevant to 17 of the 19 RPA Program contemporary issues.

NATIONAL PROBLEMS

Accelerated research in response to critical, emerging natural resource issues focused on six national problems: global climate change; threatened, endangered, and sensitive species; water quality; southern forest productivity; catastrophic forest fire; and enhancement of forest-based economies in rural America.

Global Climate Change

Global Climate Change Research Program. Evidence indicates that the Earth's climate is changing. This change along with acid deposition and other factors will have a major effect on forest ecosystems. Findings from global climate change research will be used to develop multiple-use forest management practices and increase knowledge of ecosystem dynamics.

Forest Service research shows that high-elevation forest ecosystems in the Rocky Mountains and the Sierra Nevada range are affected by climate variability and air pollution stress. Scientists have shown that atmospheric variability helps explain winter snowpack variability, the timing and composition of spring runoff, the effects on salmonid populations, and greater susceptibility of trees to damage from unusual temperature variations if exposed to certain air pollutants. Scientists developed computer simulations to predict the increased potential for forest fires caused by changes in long-range weather patterns and climate.

Forest Response Program. The Forest Response Program ended in 1990. This program, begun in 1984 as part of the National Acidic Precipitation Program, involved the Forest Service, the U.S. Environmental Protection Agency, and the forest industry through the National Council of the Paper Industry for Air and Stream Improvement.

Highlights of scientific findings include:

- Air pollution is adversely affecting trees in the Sierra Nevada range in central and southern California; it is more widespread than previously thought.
- Highly acidic cloud water is damaging high-elevation red spruce forests in the Eastern United States.
- Most forests in the Eastern and Western United States are not showing damage attributable to current levels of acidic precipitation or ozone.
- Ozone causes foliar injury, decreases growth, alters

photosynthesis, and increases mortality of sensitive individuals of tree species.

- Ozone might be impairing the growth of some southern pine forests.
- Changes in soil chemistry from acidic deposition were observed in eastern hardwood forests.
- Tree physiology and growth models indicate that tree variability can mask responses to air pollutants, physiological processes can compensate for pollutant damage, and pollutant effects are manifest through many mechanisms.

High-Elevation Snowpacks—A Surprising Source of Carbon Dioxide. Quantifying the carbon cycle is the first step in mitigation for possible global climate change. Research in the Wyoming Rockies has identified a surprising source of carbon dioxide—subalpine snowpacks. Carbon dioxide accumulates at the bottom of snowpacks in concentrations up to six times higher than levels in the surrounding air. The carbon dioxide is released into watersheds during pulses of spring acidic snow-melt.

Acid Rain Sulfur Accumulation in North Central Forest Ecosystems. Researchers from the North Central Station and the University of Minnesota's Soil Science Department indicate

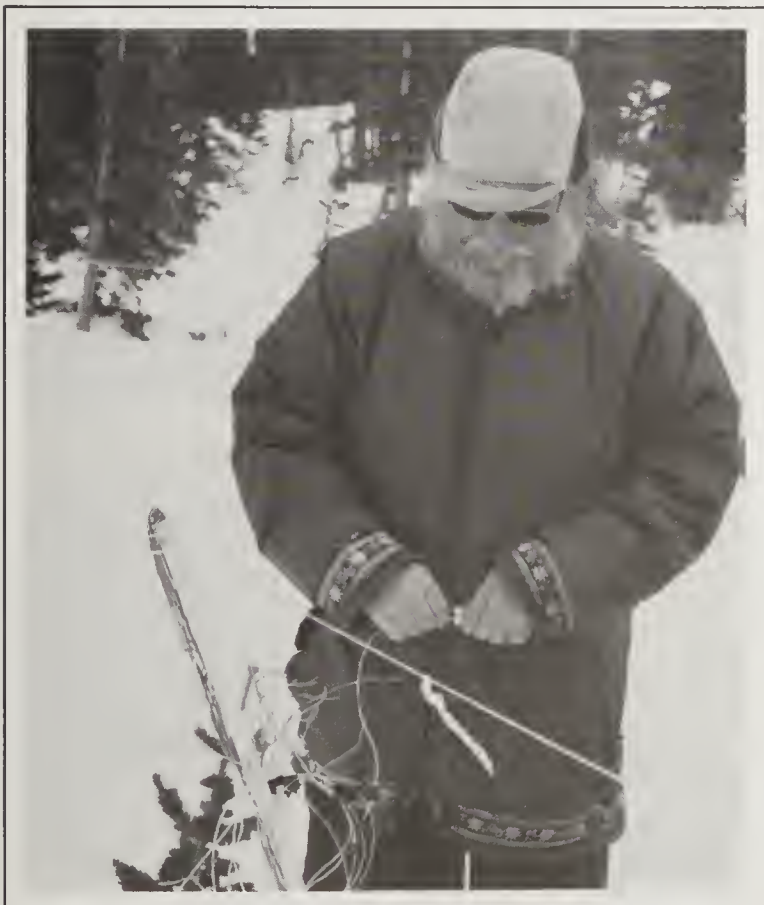
that atmospherically deposited sulfur is accumulating in soils and wood in northern forests. Accumulation levels could slow forest growth if atmospheric sulfur-dioxide emissions continue at recent levels. Researchers found that the sulfur content of soils and five different tree species (different forest types) increases as sulfate deposition increases from west to east across the States of Minnesota, Wisconsin, and Michigan. Additional accumulations of sulfur in these soils could lead to the loss of essential growth nutrients, such as calcium, magnesium, and potassium, and could further soil acidification.

New Global Climate Change Assessment Models. Scientists from North Central Station, Michigan State University, and the University of Minnesota developed a whole-tree ecophysiological growth process model for understanding how various global climate changes might affect forests. The model evaluates the simulated above and below-ground effects from changing environmental stresses on tree growth. It also can be used for early selection and breeding, teaching, and the identification of areas for further research.

Forest Health Monitoring. The Forest Health Monitoring program was initiated in 1990 to study the long-term productivity, health, and diversity of the Nation's forests. First-year results include the design and establishment of a plot network to quantify tree growth rates, tree vigor, soil and site factors, stand composition, landscape characteristics, insect and disease occurrence, climate change and extreme weather, atmospheric pollution and deposition, and other direct anthropogenic forest stressors. Changes in forest condition are compared over time with measured stress. Measurements were taken on more than 6,500 mature trees, 14,000 seedlings and saplings, and 730 standing-dead trees on 206 forested plots in 1990.

Carbon Storage Estimates for U.S. Forests and Timber Products. Information about carbon storage and accumulation in forests helps in developing national forestry programs, such as the President's America the Beautiful tree-planting initiative and regional and local programs sponsored by companies or individuals interested in offsetting their own carbon dioxide emissions. New knowledge that supports efficient forest management and tree-planting efforts includes the following estimates:

- Carbon storage in U.S. forest trees, soil, forest floor, and understory vegetation by State, region, and forest type.
- Current carbon accumulation and depletion rates.
- Prospective changes in carbon storage under different growing conditions.
- Allocation of carbon removed from forests to various wood products, residues, and other end uses.
- The disposition over time of carbon removed from forests, including the retention period in wood products, addition rates to landfills, the burning of residues and wastes, and atmospheric emissions.



Scientist measures carbon dioxide from a network of tubing embedded in a snowpack at Glacier Lakes Ecosystems Experimental site in southern Wyoming.
Photo by B. Musselman



Adult spotted owl. Photo by M.J. Griffith

Threatened, Endangered, and Sensitive Species

Research on threatened, endangered, and sensitive (TES) species identifies resource requirements, determines organism and population responses to habitat manipulation, develops population viability assessments, and develops recovery and management technologies. Species recovery requires cooperation and effective partnerships. Researchers at the Pacific Northwest Station formed the Rare Plant Consortium, with 22 cooperating institutions, to develop management guidelines for rare and endangered plants. A partnership with The Nature Conservancy produced policy, management guidelines, and research to protect and enhance biodiversity.

Northern Spotted Owl. The Forest Service manages lands in western Oregon and Washington and northwestern California containing 71 percent of the remaining northern spotted owl habitat (5.1 million acres). Pacific Northwest Station researchers measured the abundance and diversity of spotted owl prey in the Mixed Conifer Zone of southwestern Oregon, the Western Hemlock Zone in the Oregon coast ranges, and the Western Hemlock Zone on the Olympic Peninsula in Washington. The diversity and total biomass of major prey species decreased markedly from southwestern Oregon to the Oregon coast ranges and from the coast ranges to the Olympic Peninsula.

The Forest Service, the Bureau of Land Management, the Fish and Wildlife Service, and the National Park Service commissioned the Interagency Scientific Committee to address the

conservation of the northern spotted owl. This group recommended the establishment of habitat conservation areas with adequate forest cover on intervening lands to ensure dispersal. An interagency task force of high-level administrators from the Departments of the Interior and Agriculture, the Environmental Protection Agency, and the Council of Economic Advisers developed recommendations on how the Forest Service should manage to maintain the northern spotted owl while minimizing the effect on local economies. A preliminary estimate of the economic effects of implementing the conservation strategy and changes in forest plans projected a potential timber-based job loss of 28,000 by the year 2000.



Artificial nest cavity for red-cockaded woodpecker. Photo by Carol Ferguson

Red-Cockaded Woodpecker. Since Hurricane Hugo, Southeastern Station and national forest biologists have been restoring the red-cockaded woodpecker habitat on the Francis Marion National Forest. Before Hugo, the Francis Marion had the primary population, but the storm destroyed 87 percent of cavity trees and killed 60 percent of the birds. Forest Service biologists have replaced the destroyed natural cavities with three types of artificial cavities. By saving birds that would have died and by improving breeding success, the new cavities have doubled the population since Hugo struck. The technology is now being considered for use throughout the woodpecker's range.



Red-cockaded woodpecker finds a new home in an artificial cavity installed by the Southeastern Forest Experiment Station biologists.
F.S. Photo

Water Quality

The Forest Service manages 128,000 miles of rivers and streams and 2.2 million acres of lakes and ponds. The abundance and quality of water affect municipal, domestic, agricultural, and industrial water supplies. The volume, timing, and quality of surface and ground water are important in maintaining the Nation's wetland and riparian ecosystems.

Studies in critical regions have produced results useful to managers. For example, cumulative watershed effects models predict the impacts of proposed management activities on water quality and aquatic habitats for areas in California and

Idaho. Findings show that previous assessments of management impact in California were underestimated and that long-term forest planning needs to be re-examined to better balance the tradeoffs between timber harvest and water quality. The Idaho model predicts the amount of stream sediment produced by various forest management practices and the time required for remediation of stream quality.

Southern Forest Productivity

The 182 million acres of forest land in the 13 Southern States comprise one of the Nation's greatest renewable resources. These southern forests provide valued cash crops, tourism, outdoor recreation, and a retirement environment. To provide for increasing demands, southern forest growth must be improved, and management developed to sustain productivity and protect ecological values.

Research addresses forest management needs and public concerns for the southern environment. For example, longleaf pine once covered 60 million acres of southern forest land but now exists on only 4 million acres. Research is enabling us to restore the longleaf pine ecosystem. Research provided information on regeneration, management, genetic improvement, pest management, volume-growth prediction and economic management. These results were summarized in "Management of Longleaf Pine," Forest Service General Technical Report 50-75.

Additionally, multi-disciplinary research planning will integrate broad-scale research on the long-term impacts of management on southern forest ecosystems. Although most of this effort is on public lands, recommendations will apply to similar situations on private lands as well as to the program, Ecological Perspective for Managing Forests (see under heading "Forest Management" later in this chapter).

Catastrophic Forest Fire

Research on catastrophic forest fire directly supports the 1990 RPA Program goal of increased efforts to prevent catastrophic fires, to predict fire behavior, and to develop forest plans that consider the potential for catastrophic fire. The adverse effects of catastrophic fires are not limited to the burned-over area. Forest fire smoke can affect local, regional, and global air quality and can be harmful to human health.

Fire Modeling. A new information system allows managers to quickly determine likely long-term effects of fire. New computer models were developed to better predict the effects of spotting and crown fires. Forest Service scientists are helping planners, local fire departments, and homeowners cope with catastrophic wildland fires in the wildland urban interface.

Chamise Chaparral Fire Potential. Resource managers working with southern California chaparral use shrub canopy age as a mortality index for research and management decisions, especially those aimed at mitigating catastrophic fires. A

Report of the Forest Service

1990 analysis of chamise (*Adenostoma fasciculatum*) seriously questions the current practice of predicting the fraction of dead shrub (and hence the potential for fire) as a basis for shrub canopy age. Findings will modify fire hazard ratings and help us manage for biological diversity through prescribed fire.

Long-Term Postfire Succession. Scientists at the Intermountain Station Fire Sciences Laboratory developed a computer model that simulates four processes of ponderosa pine-mixed conifer forests: tree regeneration, growth, and mortality; live and dead fuel accumulation; fire behavior; and fuel reduction based on climate and site characteristics. The model will predict the species, size, and quantity of trees over long periods under different management (such as aggressive suppression of all wildfires and application of prescribed fires at various intervals and severities). The model assesses the effects of climate change on tree growth, fuel accumulation, and potential for wildfires.

Enhancement of Forest-Based Economies in Rural America

Forest Service Research can enhance the economy of natural resource-dependent communities in rural America. The focus ranges from socioeconomic studies to policy analysis.

Red Alder Contribution to Western Timber Supply. Pacific Northwest Station researchers and cooperators used lumber volume and grade recovery data to show red alder is similar in value to Douglas-fir. As a result, timber managers and manufacturers are using red alder more and are integrating its management with Douglas-fir and western hemlock. Because the majority of red alder is located on State and private lands, the findings can help increase timber supply from nonindustrial private forest lands.

Timber Bridges. Approximately 50 percent of the bridges on U.S. secondary and rural roads are structurally or functionally deficient. To improve rural road systems and benefit local economies, research was conducted on timber bridges, which cost approximately 30 percent less to build than concrete or steel bridges. Forest Service researchers evaluated timber bridge design, construction, inspection, and maintenance and published a procedures manual in 1990. Approximately 150 bridges in more than 40 States have been approved for construction. Since 1988, more than 40 timber bridges have been built on national forests.

Economic Benefits From Threatened and Endangered Species Restoration. The economic benefits of restoring threatened and endangered species, such as the Atlantic salmon, wild turkey, and bald eagle, were documented by Northeastern Station scientists and cooperators in 1990. Results show that New England residents obtained extramarket values worth more than \$125 million annually by restoring these species. Forty percent of all threatened, endangered, and sensitive species are subject to restoration programs. This research has demonstrated the cost-effectiveness of one res-

toration program and provides a new method for benefit analysis.

FOUNDATION PROGRAMS

The foundation for Forest Service Research consists of studies organized into five program areas: forest protection, resource analysis, forest management, forest environment, and forest products and harvesting.

Forest Protection

Forest protection research helps prevent, predict, control and reduce the effects of wildfires, insects, and diseases; make use of fire in a productive and environmentally safe manner; protect wood products and structures from damage by insects and decay organisms; and monitor and predict global climate change effects on forests.

Fire and Atmospheric Sciences Research

Air Quality. The Forest Service pioneered the identification and understanding of pollution effects on forest ecosystems. The agency developed screening procedures to assess possible pollution effects on resources in wildernesses.

Disturbances and Disasters. Forest Service research on the natural role of forest fires helps reduce the costs for fire suppression and protects lives and property. A "home risk meter" translates fire research findings into a format accessible to homeowners so they can identify and correct risk factors. Research has contributed to understanding the recovery and regeneration processes of forests adjacent to Mount St. Helens and to recovering forest resources following the disastrous 1987 fires in California and Oregon.

Insect and Disease Research

Biological Control for Environmentally Sound Management. Forest Service research is providing an array of biological alternatives to chemical pesticides, including natural enemies for controlling insect pests or noxious weeds, microbial agents, and semiochemicals (naturally occurring compounds that guide insects to a mate or suitable host). For example, the larch casebearer, a major defoliator of western larch, has been reduced to nonpest status through the successful release of a parasite. In another study of parasites for pest control, scientists located a moth in Europe that feeds on gorse—a noxious weed threatening the health of tropical forests. The moth has been released and is now well established in Hawaii.

Northeastern Station scientists significantly improved the field efficacy of the environmentally safe bacterium *Bacillus thuringiensis* for controlling the gypsy moth. In a 1990 testing of a new aerial application procedure on the George Washington National Forest, the bacterium was found to cover 98 percent of the leaves. This procedure gave excellent foliage protection and a

25-fold reduction in the pest population—a rate previously achieved only with the use of highly toxic chemical pesticides. The new procedure will significantly reduce application costs and followup treatments.

The broadcast application of semiochemicals to disrupt mating is an effective and safe way to suppress or prevent insect damage. Semiochemicals, for which a commercial formulation is now registered, are used to control western pine shoot borer damage. Semiochemicals can also prevent damage by causing pests to disperse. The antiaggregation pheromone of the Douglas-fir bark beetle (methylcyclohexanone) prevents the beetle from colonizing trees felled by storms—events that normally lead to explosive populations. Registration of a commercial formulation needs to follow for large-scale operational use.

Mountain Pine Beetle Model. The mountain pine beetle is a serious killer of pine throughout Western North America. Pacific Northwest and Pacific Southwest scientists developed a beetle colonization model that has demonstrated that beetle selection of trees is based on diameter (large trees preferred) and vigor (low vigor preferred). The results indicate that stocking control (thinning overcrowded stands) will reduce beetle attack. We have improved the hazard ratings for tree susceptibility to attack and can apply ratings when designing thinning operations.

Termite Control. The costs to repair or replace wood structures damaged by subterranean termites exceeds \$800 million per year in the United States. Researchers at Gulfport, MS., identified several new ways to control termites, isolated antitermitic compounds from Port Orford cedar and eastern redcedar, and developed methods for quantifying termites per colony. These new methods and chemicals provide environmentally safe tools for combating termites and other wood-destroying organisms. A new termiticide that has a low persistence in the environment (Prevail) was registered by the Environmental Protection Agency. Borate-treated wood was found to be safe from damage by termites, carpenter ants, and lyctid powder post beetles.

Brown-Rot Decay. Brown-rot fungi cause the most destructive form of wood decay through the release of biochemical agents that penetrate and degrade wood cell walls, reducing wood strength. Scientists at the Forest Products Laboratory discovered how these degrading agents are directed to the specific site of attack. The pathway is also used for transport of nutrients to the fungus. This knowledge is essential for developing target-specific inhibitors.

Oak Wilt Control. Oak wilt is one of the most destructive hardwood tree diseases in the United States. Southern Station researchers and Texas A&M University cooperators are the first to control oak wilt successfully. Guidelines for identifying and managing oak wilt are available. The fungicide propiconazole, registered under the trade name Alamo, provides excellent control of oak wilt. Researchers also verified the uptake and distribution of a bacterial control agent, *Pseudomonas cichorii*.

Western Gall Rust. Gall rust is potentially a major problem in ponderosa pines selected as breeding stock in tree improvement programs. In 1990, Intermountain Station scientists measured the heritability of gall rust resistance in families of trees within and among stands located in the lower Columbia River system. This work will enable tree improvement personnel in the northern Rocky Mountains to select stock resistant to gall rust. Proper selections of base stock will ensure that gall rust does not develop into a major problem in ponderosa pines seeded or planted in area forests.



Western gall rust on ponderosa pine shows a susceptible reaction.
Photo by Ray Hoff

Pest-Resistant Forest Trees. Results of a breeding program for loblolly and shortleaf pine increased the level of resistance to fusiform rust from 16 percent to more than 60 percent—and promises future levels greater than 80 percent. The results led to the establishment of the Bent Creek Rust Resistant Screening Center for producing resistant seed. Resistance was also demonstrated for butternut canker, white pine blister rust, and beech bark disease. New, promising biotechnological methods were developed to rapidly produce resistant seed where traditional methods of plant breeding failed.

Report of the Forest Service

Resource Analysis

Forest Inventory and Analysis

Hurricane Hugo's Impact on Forest Resources. In September 1989, Hurricane Hugo caused extensive mortality and damage to forest stands in South Carolina. Researchers at the Southern and Southeastern Stations quickly developed and implemented studies to assess the nature and extent of losses. The results show that 4.5 million acres (69 percent) of timberland in 23 counties of South Carolina sustained severe damage. The storm reduced softwood volumes by 1 billion cubic feet (21 percent), with an additional 6 percent loss anticipated within 2 years. Hardwood volumes were reduced by 300 million cubic feet (6 percent).



Researcher records damage and mortality data. This stand was damaged by Hurricane Hugo. Photo Gerald Craver

Based on inventory data, the South Carolina Forestry Commission estimates that forest landowners will incur about \$1.25 billion in loss or devalued stumpage—not including losses from plant closings, regeneration costs, or reductions in salaries and revenues. Inventory data are used to develop plans for forest regeneration, recovery, fire control, and wood procurement.

Vegetation Classification System for Alaska. A 10-year, multiagency effort to produce a classification system for all vegetation in Alaska was completed in 1990. The Pacific Northwest Station in cooperation with the University of Alaska, the Alaska Department of Natural Resources, the Fish and Wildlife Service, the Bureau of Land Management, and the National Park Service conducted the study. The classification

system is being used to create land use and vegetation maps and to inventory the distribution of threatened and endangered plant species in Alaska.

Renewable Resource Economic Research

National Timber Productivity. In 1990, the Forest Service developed measures of national forest productivity for softwoods and hardwoods for a 35-year period (1952 to 1987). Productivity measures are based on timber inventory, timberland area, net annual growth, and annual timber removal data.

While the quantity of softwood timber capital (volume or inventory of timber-growing stock on timberland) remained relatively constant over this period, productivity generally improved for all owners and regions, except for decreases in growth and inventory in the South and North and decreases in removals and inventory in the North. The largest gains in softwood productivity occurred on forest industry, national forest, and other public lands. Conversely, hardwood forest productivity declined across all ownership groups and regions, as inventory increased more rapidly than growth, with the only exception observed in the West from 1977 to 1987.

Timber Demand and Supply Trends for North America. The current condition of North American timber and the trends and prospects for raw material and forest product supply and demand were evaluated and summarized in the 1990 United Nations report "Timber Trends and Prospects for North America." This evaluation will be used with findings by the Economic Commission for Europe's Timber Committee to project world supply and demand trends.

The North American analysis determined that demands for all timber products are increasing; for example, North American roundwood consumption is projected to increase 76 percent by 2005, with 1985 as the base year. Production from United States private lands and Canadian public lands is increasing and is likely to meet increasing supply needs.

Forest Planning Analysis on Microcomputers. In 1990, Rocky Mountain Station (RMS) scientists developed an economical alternative to running forest planning analyses on mainframe computers. RMS FORPLAN, the new microcomputer version of the linear programming system used to develop and analyze alternative forest plans, retains all the mainframe capabilities. National forests in the Pacific Northwest saved more than \$200,000 in computing costs during the first 2 months of system use. Since then, other national forests have adopted the system.

Timber Market Implications of Accelerated Wastepaper Recycling in the 1990's. In 1990, the Forest Products Laboratory found that accelerated recycling will have a substantial impact on timber markets. Pulpwood needs will grow more slowly as wood pulp consumed per ton of paper drops a projected 14 percent because of increased wastepaper use.

Projected future price increases for pulpwood and sawtimber in all regions will be substantially reduced. These findings provide land managers with information as they seek to balance the protection of threatened and endangered species, old-growth forests, and timber supply.

Even-Flow Timber Sale Policies and Community Stability. Many national forests sell equal volumes of timber each year, regardless of economic conditions, with the intent of promoting community economic stability. Completion of a study in 1990 led researchers at the Southeastern Station, Oregon State University, and the USDA Economic Research Service to question the merits of this policy. When potential benefits and costs of an effective even-flow policy were estimated and compared with a marketing approach to timber sales, the benefits to local areas were found to be small, while costs (including forgone revenues) were relatively high. The results suggest that a marketing approach to sale scheduling, administered within the framework of national forest plans, holds promise for improving the profitability of timber management.

Estimate Multiple-Resource Outputs. Quantifying tradeoffs among regional outputs is difficult because of the large data requirements. Analysts at the Rocky Mountain, Southeastern, and Southern Stations demonstrated the effects of regionwide forest management activities on forage, wildlife, and water production in the South. For example, continued harvest of old-growth southern pines would eliminate the red-cockaded woodpecker—reinforcing the importance of habitat management on national forests for the protection of this species.

Forest Recreation Research

People and Resource Relationships. Studies by North Central, Rocky Mountain, and Pacific Southwest Stations provided new knowledge about people and natural resource relationships. Models developed for evaluating recreational site choices show that trees and other natural features were important factors influencing people's choices among sites. These models are being used to predict how users will respond to changes in the recreation sites' physical and social environments. For example, visitors viewing ponderosa pine forests indicated a willingness to pay for camping in parklike stands, with large trees and a minimum of downed logs and dead trees.

Urban Forests. A survey of householders in 8 cities produced a ranking of 10 tree species commonly planted on city streets and a list of the benefits and annoyances that residents experienced from each tree species. Urban foresters are using this information to select trees that will be the most enjoyable to residents.

Wilderness Management. Research on wilderness included developing methods to better manage for biodiversity, threatened and endangered plant and animal species, water quality, recreational needs, wetlands preservation, range and livestock grazing options, and mineral development options. Methods

are documented in symposium proceedings published by the Southeastern and Rocky Mountain Stations (General Technical Reports SE-51 and RM-193, respectively).

Forest Management

Forest management research achieves higher productivity from forest lands by developing economically, biologically, and environmentally sound forest management practices. Examples follow from studies of the physical, biological, and genetic factors controlling development of individual trees, stands, and forests.

Whitebark Pine Establishment and Survival. Maintaining an abundant supply of whitebark pine, and the pine nuts it produces, is essential for the survival of the threatened grizzly bear in the Yellowstone ecosystem. In 1990, Intermountain Station scientists identified biotic and microsite factors that affect seed germination and seedling survival of seeded and planted whitebark pine. Ecological modelers and land managers use this information to help maintain grizzly bear populations. Whitebark pine grows at the upper timberline zone; therefore, changes in its health and productivity are important to global climate change investigations.

Stand Dynamics of Loblolly Pine. Mathematical modeling of the growth and yield of loblolly pines shows that plantations established at close spacings outperform those at wider spacings early in life. This advantage is lost over time because of greater competition and higher mortality in denser stands. In 1990, Southeastern Station scientists developed new models reflecting these complex processes. Revised planting and thinning guidelines were prepared and are being distributed to southern tree farmers through extension foresters.



Recreational trails, following an urban river, support a wide variety of activities. Photo by J. Dwyer

Report of the Forest Service

Long-Term Site Productivity. The National Forest Management Act requires that national forest land management does not degrade long-term productivity. Forest Service Research and the National Forest System are developing soil quality-monitoring standards at sites in Louisiana and California. The work will be expanded to other regions of the United States, and possibly Canada, New Zealand, and Australia. The network of installations and climatological data collected can be used in climate change research on forest processes.

Conservation Biology. Many wildland species are already threatened with extinction or genetic loss because of habitat disturbance and loss. Projected global warming and increasing social impacts magnify these threats. The Pacific Southwest Station established the Center for Conservation of Genetic Diversity to promote research on genetic diversity. Scientists found that overstory removal treatment had a greater effect on genetic composition than did precommercial thinning in natural stands. The results stress the importance of using the appropriate seed source to ensure an adequate number of future parents in the seedling population.

Genome Mapping and Gene Isolation in Forest Trees. The Forest Service Institute of Forest Genetics in Placerville, CA, completed formative work on genetic mapping of loblolly pine and Douglas-fir; a map should be finalized by the end of 1991. Institute scientists also isolated the first known transposable element from Monterey pine. Isolation is the first step in tagging a specific gene for genetic engineering modification.

Ecological Perspective for Managing Forests. This program, initiated in 1990, emphasizes ecological values (biological diversity, forest health, and sustained productivity) and socioeconomic considerations (old-growth forests, the acceptability of new management techniques, and the effects of decreasing commodity production on regional economies) for forest and rangeland management. A recent publication, "Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource," is a product of this program.



Whitebark pine--an ecosystem study. Photo by Wyman Schmidt



Researcher at Warren, PA, examines some of the forest management recommendations provided by the computer-based Northeastern Decision Model. Photo by David Marquis

Northeastern Decision Model. Northeastern Station scientists and cooperators are developing the Northeastern Decision Model—a computerized multiple-use decision support system that will enhance multiple-use management in all major forest types and regions of the Northeast. Data on silviculture, growth and yield, harvesting, economics, wildlife habitat management, landscape ecology, integrated pest management, watershed management, and ecosystem protection and maintenance will be integrated for decision making. The recommendations are based on management goals given by the user and are appropriate for both individual and aggregate stands. A prototype of the Northeastern Decision Model will be available in the summer of 1991 for user comment and testing.

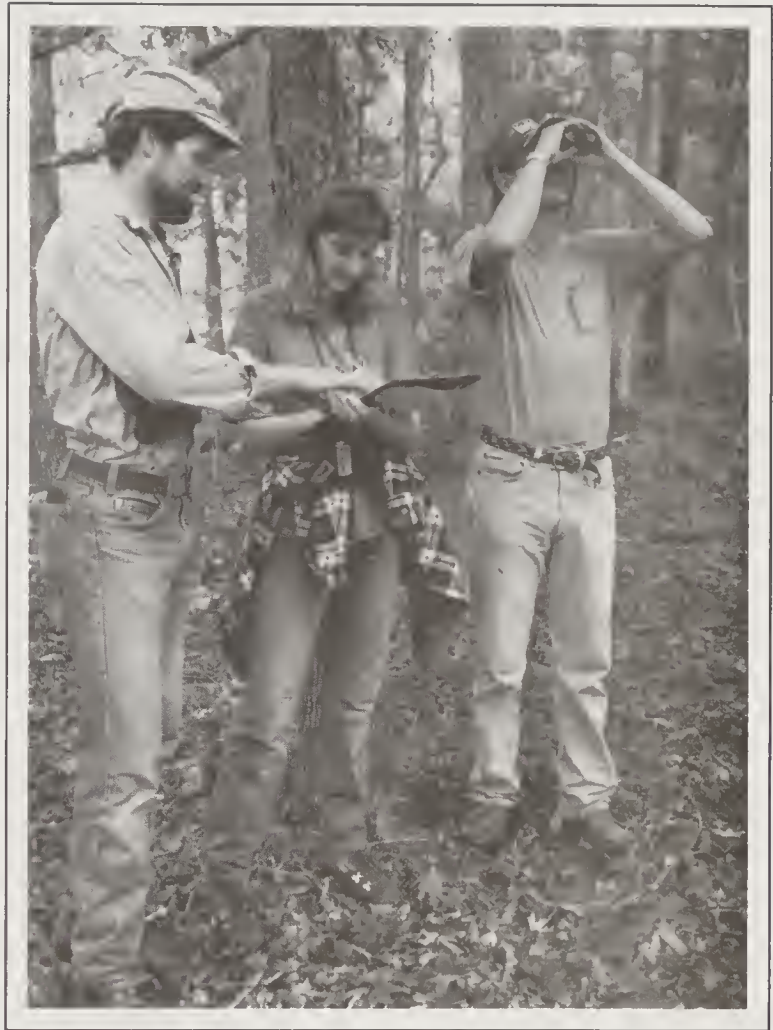
Wetlands Conservation and Management. Draining and clearing have greatly reduced wetlands in the Southern and Southeastern States. The Southeastern Station and Clemson University jointly established the Center for Forested Wetlands, in Charleston, SC. Center projects include the modeling of growth, composition change, and the effects of precommercial treatments; the study of headwater swamps and their response to various conditions; and information collection and exchange efforts, such as workshops, symposia, and literature searches.

Research Natural Areas. This program supports multiple-use goals by preserving lands for ecological research, education, and the maintenance of biological diversity. These areas are examples of pristine, unique, and important forest, shrubland, and grassland ecosystems. Since 1927, 226 sites comprising 228,000 acres have been established on National Forest System lands; approximately 460 more candidate areas are being considered. Including the 226 research natural areas on the national forests, a total of 500 ecological sites have been established on lands held in both public and private ownership.

Forest Environment

The San Dimas Lysimeters. Large, unconfined lysimeters (devices that measure water flow through soils and collect soluble constituents) were established in the 1930's on the San Dimas Experimental Forest. Studies indicate that soil horizon development is evident after only 50 years, much faster than the standard textbook estimate of 3,000 to 4,000 years. This information questions the validity of clay horizon presence as an indication of long-term site stability.

Rangeland Productivity. Extensive areas of rangelands in the semiarid Southwest are in poor condition. At the same time, large municipalities have problems disposing of sewage sludge. Range scientists at the Rocky Mountain Station have a single solution to both problems—one application of Albuquerque municipal sludge more than doubled yields of blue grama, the primary forage grass, and increased forage quality. Soil nutrients such as nitrogen, phosphorus, and potassium increased significantly; concentrations of heavy metals, an initial concern, did not increase. The Environmental Protection Agency is now evaluating the results of this study, cooperatively funded with the Bureau of Land Management.



North Central researcher instructs students on how to study effects of timber harvesting on bird populations. Photo by J. Hutchinson



Researcher collects floristic data in the proposed Aquarius Research Natural Area on the Clearwater National Forest.

Photo by Dave Tiipettis

Biodiversity. North Central Station researchers demonstrated that managing for the most diverse local communities is not likely to accommodate rare members of less diverse communities. Working in Lakes States aspen and Missouri oak forests, researchers found that young, regenerating stands may be as diverse as mature forests, but they have different kinds of animals. The findings indicate that forests of varying ages are needed to meet regional objectives for wildlife management and biodiversity. Also, the spatial location of mature forests and other habitats (such as clearcuts and open lands) are important for the immigration of animal populations from nearby, more productive areas. Considering spatial distribution of critical ecosystems will keep many species from being listed as threatened and endangered.

Ecological Research. Long-term ecological research sites provide reference measurements and studies that define the extent of ecosystem changes resulting from management practices and other naturally occurring ecosystem disturbances. These references help policymakers and managers predict the consequences of their actions.

Report of the Forest Service

These sites provided water quality and atmospheric deposition data and analyses for the National Acidic Precipitation Assessment Program. For example, long-term data from watershed studies at sites in North Carolina demonstrated that certain high-elevation soils retained less sulfur from acid rain than lower elevation soils. Watersheds with such soils can contribute to surface water pollution via runoff and can impact other resources, such as fisheries. A long-term ecological site in New Hampshire indicates soils are retaining most sulfur inputs. These and other conclusions provided input for the recently passed Clean Air Act.

Other Forest Service ecological studies provide information following natural disturbances. For example, research after Hurricane Hugo produced new information on forest rehabilitation, nutrient cycles, carbon budgets, hydrological changes, and wildlife population recovery. The results are useful for rain forest management and for the construction of local global models to study nutrient and carbon flux through tropical ecosystems. Plants and animals vulnerable to hurricane damage were identified; procedures were developed to provide wildlife with emergency food sources following major hurricanes.

Riparian Management. Excessive livestock grazing in riparian areas can be extremely damaging to wildlife habitats; however, little is known about the effects of grazing management on the habitats of small wildlife. Studies by Intermountain Station researchers found that grazing of riparian areas need not degrade small wildlife habitat and can actually improve conditions for some species.

These findings will enhance the management of the range condition of streamside areas, water quality, and landscape biodiversity. Grazing guidelines were developed and are widely distributed for livestock management in riparian areas of the Intermountain Region. Although riparian areas cover less than 1 percent of the intermountain west, they support a major part of the flora and fauna diversity.



Livestock grazing of riparian areas can be compatible with small wildlife use. Photo by Warren Clay

Forest Products and Harvesting

Fire-Retardant-Treated Plywood Roof Safety. In 1990, the Forest Products Laboratory studied the recent series of roof failures related to fire-retardant-treated plywood roof sheathing. Scientists found that the level of strength degradation depends on the fire-retardant chemicals used and the exposure temperatures.



Jones Branch artificial wetland has significantly improved the quality of acid mine drainage. Photo by Gary Wade

Building inspectors, code officials, engineers, and architects are using the results to develop safer processing and design guidelines. For example, the American Society for Testing and Materials is considering a new standard test for evaluating fire-retardant-treated plywood after exposure to elevated temperatures, and the American Wood Preservers' Association has tentatively approved modifications to its treating standards for lumber and plywood. These findings will help meet the 1990 RPA Program goal for near-term softwood timber supply by improving and extending the use of softwoods.

Old-Growth Forests. Intermountain Station scientists found that bird distribution in old-growth (200-plus years) and rotation-aged (80 to 120 years) Douglas-fir and ponderosa pine stands differs significantly. Old-growth stands had greater species diversity and abundance. A greater number of woodpeckers were observed in old-growth stands, whereas cowbirds were more numerous in rotation-aged stands. To help maintain viable populations of old-growth associated species, investigators suggest that old-growth ponderosa pine and Douglas-fir be preserved or second growth stands be allowed to mature with increased snag management.

Mined Land Reclamation. Northeastern Station scientists found that artificial wetlands can minimize the effects of mining. In 1990, Daniel Boone National Forest and Kentucky Office of Surface Mining scientists designed and constructed an 11,000-square-foot artificial wetland to improve the water quality of acid

mine drainage before it enters adjacent waters. The wetland effectively removed significant quantities of aluminum, iron, manganese, magnesium, lead, nickel, cobalt, zinc, chromium, titanium, and copper during the first 6 months of operation. The results indicate that artificial wetlands can be instrumental in improving the degraded water in acid mine drainage.

Wood-Degrading Fungi for Soil Restoration. Soils at many former and currently operating wood treatment facilities are contaminated with hazardous wood-preserving chemicals, such as creosote and pentachlorophenol. Forest Products Laboratory scientists assessed the ability of wood-degrading fungi to destroy such compounds in field soils. The study found that wood-degrading fungi depleted 84 percent of the pentachlorophenol in field soil within a 6.5-week period, primarily by converting it to an unharmed form. The results indicate that wood-degrading fungi have great potential for the remediation of contaminated soils.



Forest Products Lab studies indicate certain wood-decaying fungi can deplete hazardous wood preserving chemicals.

Photo by L. Lamar



Researchers at the Forest Products Lab study properties of paperboard using a climate-controlled chamber, leading to better designed containers. F.S. Photo

Moisture Effects on Paperboard and Containers. Corrugated containers are the single largest end use of paper and paperboard. Exposure of containers to moisture during shipping and use is the most significant cause of compression strength loss. The Forest Products Laboratory developed an apparatus to measure load duration, creep behavior, and moisture response of containers under a wide range of environmental conditions. Packaging manufacturers are using the test results to design containers that perform better.

Standard Test for Fixation of Chromated Copper Arsenate in Wood. Before fixation reactions are complete, chromated copper arsenate in wood is susceptible to leaching, with potential for human exposure. The Forest Products Laboratory developed a test to determine when this chemical reaction is complete. This test was adopted as a standard by the American Wood Preservers' Association; it is being used to develop additional techniques for accelerating fixation before marketing treated wood products.

Composite Materials. Timber supply issues are becoming more critical as more forest land base is allocated to other uses. More than 70 percent of all wood products are bonded—a research result from the Forest Products Laboratory. Examples of recent composite products now in public use include components in automobiles, piano soundboards, audio speakers, sheathing for homes, and wood fiber as a filter against chemicals.

Automated Lumber-Processing Systems. Automated techniques were developed that improve efficiency and yield in the production of furniture. Such techniques as x-ray tomography, optical image analysis, and laser cutting were developed through partnerships with industry and universities. Using 1990 findings, the National Hardwood Lumber Association evaluated a computer program for training hardwood lumber graders. Information gained from these tests can be used in developing a completely automated lumber-grading machine.

INTERNATIONAL FORESTRY

Forest Service international activities are conducted in cooperation with other Federal agencies, nongovernmental organizations, the United Nations and other international organizations and through bilateral arrangements with other countries. In 1990, Forest Service personnel participated in 16 scientific

and technical exchanges with 11 countries on subjects ranging from the atmospheric effects of tropical forest burning to genetic resistance by tree species. International Forestry participated in 23 cooperative research projects in five countries under the Special Foreign Currency Program (Public Law 480). Projects ranged from the alteration of wood characteristics in pollution-affected trees in Yugoslavia to the reforestation of mine spoils in Taiwan.

Bilateral agreements with the Soviet Union and Canada provided significant cooperative opportunities. Sanctioned exchanges with the Soviet Union focused research efforts on small mammal predators of the gypsy moth, technology and management of shelterbelts, global warming effects on northern forests, forest fire control methods, and the use of dogs to minimize undesirable contact between humans and bears. Cooperative studies with Canada were directed at fire behavior and emissions, hardwood decline, spruce budworm control, wood utilization, North American timber analysis, and mountain pine beetle management.

The Sixth International Seminar on Forest Administration and Management hosted 28 senior managers from 21 developing tropical countries. These managers were among 300 forestry and natural resources students and professionals from 60 countries who visited Forest Service locations. Approximately



Forest Service Workshop at Institute of Pacific Island Forestry in Palau, Micronesia.

Photo by Susan Huke

40 national forests hosted visitors or supplied personnel for overseas assignments.

Tropical forestry research and technical assistance were supported by additional congressional appropriations of \$1.5 million and \$2.8 million, respectively. Cooperative efforts were undertaken with the United Nations' Food and Agriculture Organization, Mexico, Brazil, and 30 other countries. Assistance was given on the Resources Assessment 1990 project, which used remote sensing technology to inventory the world's forests and estimate changes in their extent and condition since 1980. Preliminary findings indicate that tropical deforestation has continued to increase from the 1980 figure of 1 percent of the total area per year.

State and Private Forestry outreach programs in the Caribbean and the Pacific increased substantially. These included an urban tree-planting guide and training course in the Caribbean, publication of a Caribbean basin forestry newsletter, support for the fifth biennial meeting of Caribbean foresters, and a tree seed handling meeting in Honduras. Examples of assistance in the Pacific include hurricane damage rehabilitation and fire training in American Samoa, training in boundary line location for the Federated States of Micronesia, and multiple-resource inventories in Guam.

The Forestry Support Program helps developing countries by reducing natural resource deterioration and increasing the sustainable use of forest resources. The program was praised by the Office of International Cooperation and Development for interagency cooperation between the USDA and the U.S. Agency for International Development (USAID). Workshops in Africa, Asia, and Latin America informed donor organizations of women's roles in resources management.

Program assistance included the design and evaluation of the USAID/Guatemala Maya Resources Management Project, the assessment of forestry graduate education in Indonesia, and the initiation of a new Indonesia-U.S. Professional Forestry Collaborative Program. The World Resources Institute and the Forestry Support Program developed a Dominican Republic Tropical Forestry Action Plan. Program funding expanded, and operations were extended 10 years.

The Disaster Assistance Support Program, funded by USAID's Office of U.S. Foreign Disaster Assistance, conducted disaster management and preparedness training for the disaster response team. The Forest Service developed a disaster management curriculum for Latin American countries and a workshop that led to establishing a drought and famine mitigation project. During 1990, the Disaster Assistance Support Program responded to such emergencies as Hurricane Hugo in the Caribbean and food relief efforts in the Sudan.



Photo by Jim Hughes



ADMINISTRATION

A Year of Progress



IMPROVING AGENCY PRODUCTIVITY

Management Improvement

Total Quality Management. Total Quality Management remained a primary management initiative for the Forest Service. In line with Administration emphasis, the Intermountain Region, the Chief's Office, and the Geometronics Service Center actively continued to focus on customer requirements, a people-oriented management philosophy, and a work culture fostering initiative, creativity and reduction of bureaucratic constraints.

During 1990, the agency's test unit, the Intermountain Region, completed the necessary training of all employees, and initiated Total Quality Management teams on several projects. In the Chief's Office, the Administration and Research Deputy Chief areas began training for their top managers and developed action plans to implement Total Quality Management. During 1990, numerous other Forest Service units also began Total Quality Management programs.

USDA Demonstration Project. The Forest Service and the USDA Agricultural Research Service, with support from the USDA Office of Personnel, implemented the USDA recruitment and hiring Demonstration Project. After 2 years of planning, training, and systems development, the Forest Service began using this new authority on July 1, 1990, to test several innovations to the Federal recruitment and hiring systems. Early surveys show a high approval rate among managers and improved workforce diversity.

Master Labor Agreement. The Forest Service implemented its Master Agreement with the National Federation of Federal Employees, covering approximately 15,000 agency employees. The agreement improved labor-management relations and reduced the number of litigation cases and their costs.

MANAGING THE HUMAN RESOURCE

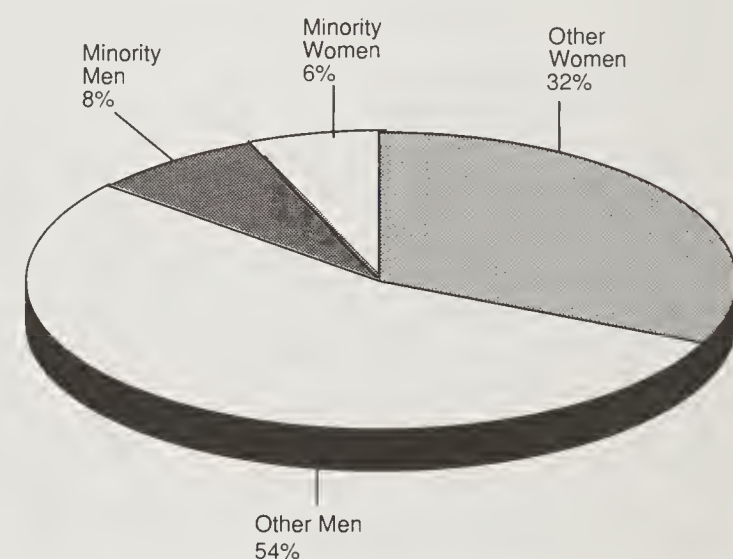
Workforce Diversity

Workforce Distribution. The Forest Service desires a workforce that is similar to the civilian labor force in gender, race, national origin, and disabled status (figure 51). Table 59 displays distribution of employees by program and occupational category. Table 60 displays distribution of employees by tour of duty.

Over the fiscal year, the number of female employees increased by 1,286 (38 percent of the permanent workforce) and the number of minority employees increased by 375 (14 percent of the permanent workforce). These gains in female and minority employees occurred in most occupations but were greatest in professional and administrative occupations. For example, the agency added 479 women and 75 minority employees to pro-

Figure 51.

1990 Permanent Workforce Composition



fessional occupations. Although the agency is proud of its accomplishments, it still recognizes the need for further improvement.

The Forest Service moderately increased the employment of people with disabilities but still falls short of matching the civilian labor force. At the end of 1990, 4.5 percent of the workforce reported a disability, and 0.8 percent of these reported significant disabilities.

Historically Black Colleges and Universities Program. The Forest Service increased the amount of research, the number of summer students and cooperative education students, and the number of new hires from Historically Black Colleges and Universities. In fact, the agency employed 209 summer students from the 17, 1890 land-grant colleges and universities.

Native American Employment Program. The Forest Service established two liaison positions for Native Americans—one at Haskell Indian Junior College, Kansas City, KS, and the other at Fort Collins, CO. These efforts also increased the number of Native American summer students and cooperative education students. The program increased these students' interest in natural resource careers.

HUMAN RESOURCE PROGRAMS

Human Resource Programs provide job opportunities and training for youths, the unemployed, underemployed, economically disadvantaged, and elderly while carrying out high-priority conservation work. During 1990, these programs offered employment and skills training to 125,949 persons, including

many women and minorities. For an investment of \$83.6 million, \$105.7 million in accomplishments were returned from all programs (table 61). The participants constructed campgrounds, trails, office buildings, warehouses, fences, and roads; planted trees; fought fires; improved timber stands; and provided clerical support.

Job Corps. Under an agreement with the Department of Labor, the Forest Service continues to operate 18 Job Corps Civilian Conservation Centers on 15 national forests in 11 States. The focus remains on improving the enrollees' job qualifications for productive work through training in vocational skills, basic education, and social development. Presently 10 centers are co-educational. The Forest Service's goal is to convert the remaining centers to coeducational within the next several years.

Ninety-one-percent of the graduates were placed in jobs, entered college or advanced training courses, returned to school, or joined the military. The 18 Centers trained more than 9,350 students between the ages of 16 and 22 and accomplished \$19.2 million in improvements, including firefighting, community work, building construction, and forestry activities.

Senior Community Service Employment Program. This program provides persons with low-incomes, age 55 or older, part-time community service employment and training to up-



SCSEP members build restrooms at the Cradle of Forestry Visitors Center on the Pisgah National Forest in North Carolina.

Photo by Ed Fox

grade present skills and introduce new skills. In 1990, 16 percent of the participants were placed in unsubsidized private or public positions. A total of 5,842 participants produced \$36.7 million worth of conservation work for a \$1.60 return per dollar of Federal cost.



Eagle Lake YCC crew, Lassen National Forest in California studies stream life during environmental class. Photo by Dave Reider

Youth Conservation Corps. The Corps provides 8 weeks of summer employment for randomly selected 15 through 18-year-old applicants from all strata of society. Youths earn and learn while performing conservation work (such as trail improvement and maintenance, sign painting, campground maintenance, slash treatment, and livestock corral construction) on National Forest System land. The enrollees are paid from Forest Service funds. In 1990, the 1,238 enrollees' work returned \$1.48 for each dollar of cost.

Volunteers in the National Forests. Volunteers donate their talents and services to help manage the Nation's natural resources. Their number continues to grow as people realize how they can personally benefit the Nation's natural resources. During 1990, 97,227 volunteers assisted in the management of National Forest System land; they contributed 2,083 person-



Boy Scout volunteers building a trail on the Toiyabe National Forest in Nevada. F.S. Photo

Report of the Forest Service

years of work valued at \$30.2 million. Volunteers participate in resource protection and management, cooperative forestry, and research. Typical positions include campground hosts, information specialists, fire lookouts, and recreation, wildlife, and fisheries assistants.

The Touch America Project is a special volunteer effort that gives youth between the ages of 14 to 17 job experience and environmental awareness through work on public lands. In 1990, private sector organizations sponsored 6,600 youths in the Touch America Project. Project work included maintaining and building trails and constructing recreation areas.



A member of the Touch America Project repairs trail. Photo by Ed Fox

Hosted Programs. Hosted programs provide conservation training and work opportunities on national forests or in conjunction with Federal programs. Programs are administered through agreements with State and county agencies, colleges, universities, Indian tribes, and private and nonprofit organizations with multiple objectives, such as disabled rehabilitation and advocacy for elderly or at-risk youth. Most workers represent little or no direct cost to the Forest Service because funds are supplied by State health and welfare agencies, the Job Training Partnership Act, State block grants, vocation rehabilitation, college work study, and other means.

In 1990, the 12,288 participants contributed work to national forest programs valued at \$16.5 million. These programs provide a potential pool of multicultural, diverse employees who have experience in Forest Service programs.

In partnership with the Department of Justice's Bureau of Prisons, the Forest Service continued to explore the feasibility of expanding the use of minimum security inmates on National Forest System land. A 1990 pilot program on the Allegheny National Forest, in Warren, PA, was very successful. Excellent rapport was achieved between the Forest Service and the Bureau of Prisons, and work was accomplished that otherwise would not have been done because of a lack of funds and staff.

Take Pride in America. Thousands of individual volunteers and hundreds of partner organizations participated in Take Pride in America projects on National Forest System land in 1990. In September, 4 national forest projects in the Northern, Intermountain, and Southern Regions received national Take Pride in America awards, 4 others were named finalists, and 40 were named semifinalists. The winners were:

- A volunteer project for bridge and fence construction with more than 1,750 participants occurred on the Wasatch-Cache National Forest, Salt Lake City, UT.
- On the Payette National Forest's Council Ranger District in Council, ID, volunteers designed, constructed, and financed a new and safe trail. The 300 foot vertical trail was constructed from the top of Hells Canyon down the slippery rock face to a prime fishing spot.
- On the Sheepshead Recreation Complex on the Deerlodge National Forest in Butte, MT, the South Butte Kiwanis Club provided 4,200 hours of construction and maintenance volunteer service.
- The Pioneer Regional Educational Service Agency on the Chattahoochee and Oconee National Forests in Gainesville, GA, developed an environmental education curriculum to teach the importance of conserving and protecting our natural resources. They sponsored a series of teacher workshops and provided activities to be incorporated into the regular youth curriculum.

The Forest Service had the lead responsibility in 1990 for creating the Take Pride in America Living Memorial at Arlington



Campground host helps a young lady take a drink at the Yaak River Campground on the Kootenai National Forest in Idaho.

Photo by DelMar Jaquish

National Cemetery—a landscape featuring a grove of trees and other flowering plants that honors those who gave their lives for America. Arlington National Cemetery officials expect thousands of visitors every year. Located next to the cemetery Administration Building, the memorial has a panoramic view of the monuments across the Potomac River as well as the Custis-Lee Mansion. The Oak Ridge Boys, a musical group, financed the memorial.

LAW ENFORCEMENT

The Forest Service law enforcement objective is to protect forest visitors and their property, natural resources, Federal property, and agency employees. Increasing numbers of individuals are using the forests for illegal purposes including vandalism, archeological resource violations, timber theft, wildland arson, and the cultivation and manufacture of illegal

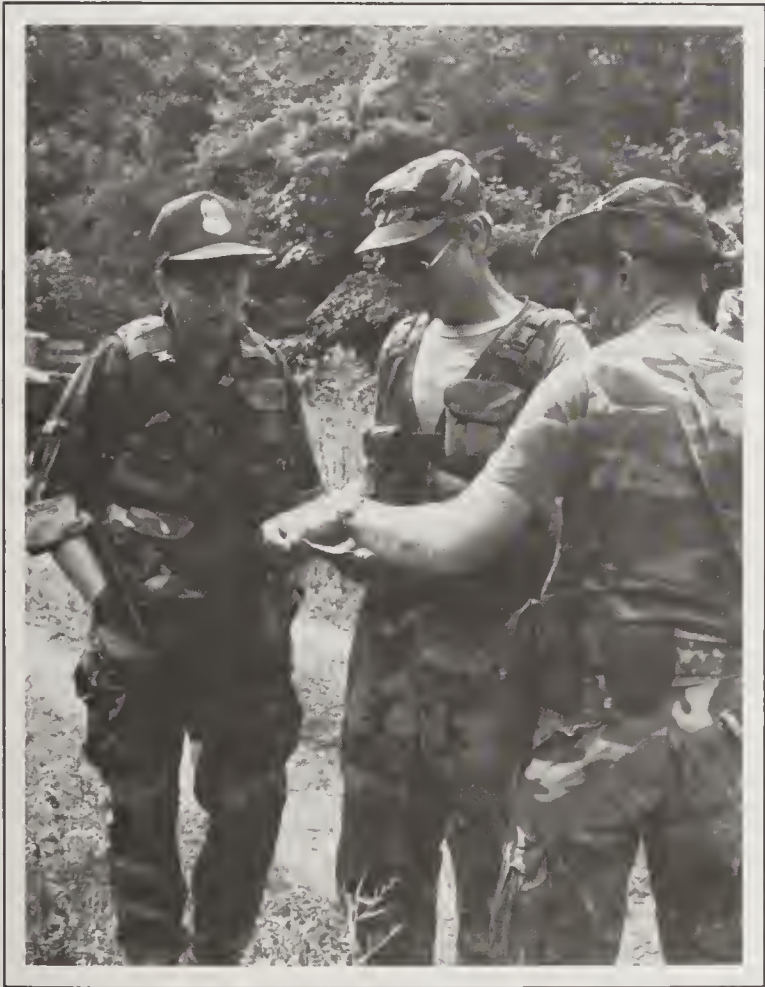
The Cooperative Law Enforcement program provides funding for agreements that allow the Forest Service to cooperate with State and local law enforcement agencies and other Federal agencies. About 400 law enforcement agreements provide reimbursement to these cooperators for protecting forest visitors and their property when they visit the National forest System lands. Mutual support between Forest Service law enforcement personnel and cooperating agencies provide visitors to these lands a higher level of protection and service, even in remote areas.

Since the enactment of the Drug Abuse Act and the President's War on Drugs, the Forest Service has been detecting, apprehending, and prosecuting persons responsible for illegal drug activities on the national forests. In 1990, the Forest Service was involved with several special operations that highlighted the drug control activities of the President's Office of National Drug Control Policy.

MANAGING THE CAPITAL RESOURCE

Receipts and Expenditures

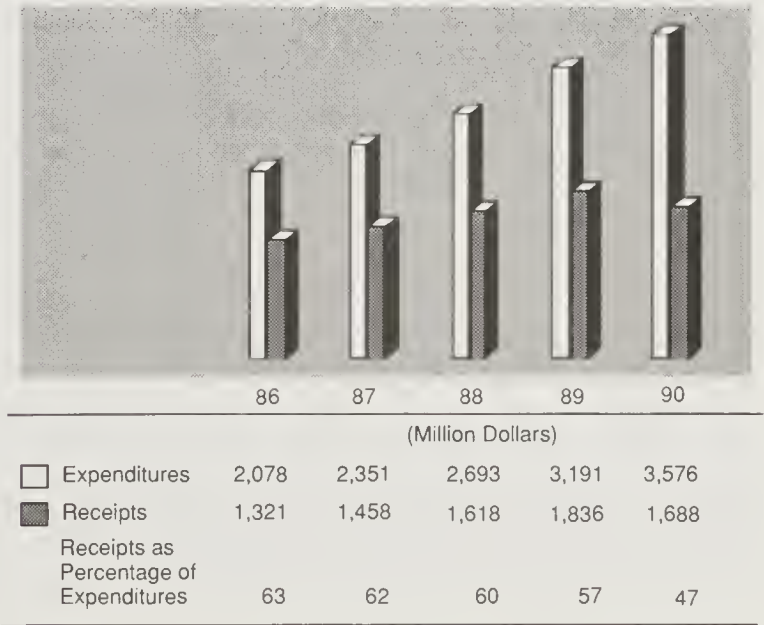
Although the Forest Service receives funds from Congress and other sources, it produces revenue. In 1990, we produced 47 cents of revenue for every dollar expended. Total receipts were \$1.69 billion, and total expenditures \$3.58 billion (figure 52, tables 62, 64-67). Receipts were collected primarily from timber sales, mineral leases and permits, grazing fees, and recreation uses. Figure 53 displays the distribution of receipts by program area. Table 63 displays a summary statement of resource values and obligations with a net benefit of \$9.8 billion.



Forest Service law enforcement officers prepare to lead inter-agency teams into the Daniel Boone National Forest searching for marijuana. Photo By Jill Bauermeister

drugs. Approximately 600 uniformed law enforcement officers and 179 special agents perform enforcement and investigation activities that are unique to the National Forest System.

Figure 52.
Forest Service Expenditures and Receipts

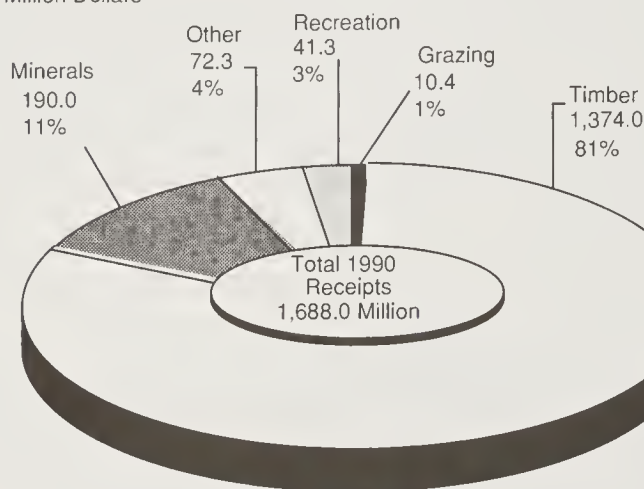


Report of the Forest Service

Figure 53.

Distribution of Receipts by Program

Million Dollars



Procurement and Property

In 1990, the Forest Service spent about \$500 million on more than 5,929 new contracts. Ninety percent of the total procurement dollars went to small businesses. Contract awards included more than \$55 million to disadvantaged businesses and \$19 million to women-owned firms. Outreach was expanded, with exhibits at national minority conferences to discuss procurement opportunities; this also proved to be an achievement. The agency initiated the use of the small purchase credit card and participated in the pilot testing of third-party drafts.

Administration performed an integral part of the National Recreation Strategy assessment by developing agency "rules of thumb" concerning planning for effective partnerships. The Forest Service again obtained permission to enter into noncompetitive Challenge Cost-Share arrangements when the "challenger" performs the work.

In 1990, Forest Service personnel managed approximately 26 million square feet of space, including buildings owned and leased by the agency and space controlled by the General Services Administration. The agency successfully relocated 80 percent of its Washington Office headquarters' personnel to newly renovated space in the Auditors Building.

MANAGING THE INFORMATION RESOURCE

The Forest Service continued a strong emphasis on treating information as a valuable resource. As with other critical resources, such as people and money, information is a resource that must be managed to obtain its maximum value.

The agency vision is to make information easy to access and share. Several principles guide our steps to achieve this vision in the 1990's. These principles are:

- Integrated—information is collected once and brought together to serve many uses.
- Readily available—information is available to each that has need for it.
- Managed close to its origin—information is managed as close as possible until it is collected by those who know it best.

Major accomplishments this year that moved the Forest Service closer to its vision were:

- Development of a framework for handling geographic resource information. This "Geographic Information Structure" resembles a filing system, but for the first time incorporates spatial information. This structure was published and distributed for agency use.
- Development of standard terms and definitions for commonly used, widely shared resource information within the Forest Service. The results of this effort were published and distributed for agency-wide use.
- Preparation of a contract for the procurement of Geographic Information System capability.

KEEPING PEOPLE INFORMED AND INVOLVED

Effective communication and strong bonds with the American people are basic to the successful, wise management of the national forests and grasslands. The Forest Service Public Affairs Office continued efforts with Forest Service employees and cooperators to examine how best to communicate with the public and build relationships that result in wise management.

Public Affairs tightened its relationships with other Forest Service staffs to help them better articulate their work, to develop communication plans and carry them out, and to evaluate successes and failures.

The 1990 RPA Program

After the Draft RPA Program was published, the Forest Service solicited comments from State and other Federal agencies, local governments, interest groups, individuals, and Forest Service employees. The comments were then analyzed, the Program revised, and the 1990 RPA Program published in June.

After publication, the Forest Service widely disseminated the message of "managing for multiple use—but with a difference"

to the public through press conferences; the Program document; an executive summary; a Program brochure, briefings for Congress, interest groups, and other agencies; and telephone responses to the media. Program recommendations were reported in the national news media and discussed in articles and editorials in magazines and newspapers. Information to employees was distributed through seminars, briefings, electronic systems, videos, and internal newsletters.

Emphasis Areas

Public Affairs placed particular emphasis in 1990 on helping staffs develop or implement communication plans to achieve their goals in these areas:

- **New Perspectives**—a program aimed at managing the national forests and grasslands for a broader range of uses in a sustainable and more environmentally sensitive way.
- **Land Management Planning Critique**—an examination of how the Forest Service and the public worked together in forest planning.
- **America the Beautiful**—a grassroots tree-planting effort to reclaim marginal lands and turn around tree loss in America's urban areas.
- **Challenge Cost-Share** partnerships, volunteering, and other cooperative arrangements.
- **Accessibility** for all visitors to the forests and grasslands.
- **Threatened and endangered species**, particularly the spotted owl and the Mount Graham red squirrel.
- **Research findings and technology transfer**, in such areas as timber bridge construction, global change and forest decline, the effect of global conditions on future research, tree nursery management and seedling propagation, and forest fire management.
- **Change on the Range**—a program to improve rangeland quality, especially riparian areas.

Special Information Activities and Environmental Education

National Forest System Centennial Celebration. Preparation to celebrate the centennial of the beginning of the National Forest System is in its second year. Many people and organizations, such as the Buffalo Bill Historical Center, the American Forestry Association, Project Learning Tree, the University of Montana, and the Forest History Society, are helping to plan, support, and sponsor centennial activities. During 1990, negotiations were begun with Telecommunications, Inc., a major cable television company, to promote the centennial and raise money for resource projects. Special features in American Forests and the Journal of Forestry describe the national forests

and their beginnings and explain the values that support their use.

Earth Day. Under the banner "Agriculture Cares" and Chief Robertson's leadership, Forest Service and other USDA agency representatives talked with people on Earth Day about what USDA does to improve the environment. USDA participated in an exposition on the Mall in Washington, DC; worked with its adopted elementary school on an Earth Day tour of the Agricultural Research Service facilities in Beltsville, MD; encouraged county forest and agriculture committees to work with local school districts in planting trees, shrubs, and other plants on school grounds; planted a commemorative tree at USDA headquarters; and published brochures, flyers, and signs.

The Forest Service conducted open houses nationwide, including at the newly remodeled headquarters in the Auditors Building in Washington, D.C. The Forest Service continued to offer its employees as environmental speakers for school and civic events, local environmental fairs, tree plantings, volunteer days, and other events. A Northeastern Area State and Private Forestry volunteer searched local public libraries to find up-to-date forestry information. Lack of information led to assembling information packets containing more than 60 publications each. The packets were sent to 181 public libraries in 8 counties in southeastern Pennsylvania.



Earth Day, Beaverhead National Forest in Montana.
Photo by Jack DeGolia

Corporate America Hears From Woodsy Owl. Woodsy Owl continues to speak on sensible environmental behavior. Along with many visits to schools, neighborhood cleanups and fairs, and club meetings in 1990, Woodsy Owl took antipollution messages, such as "Give a Hoot, Don't Pollute" and "Teaming Up With Woodsy Owl Makes Good Business Sense," to thousands at eight major trade shows and conventions. Woodsy reminded corporations that customers, stockholders, employees, and the general public value environmental conservation.

Report of the Forest Service

Woodsy Owl's "Juggler" television public service announcement sent a recycling message reaching 67 percent of all households with televisions. A recent survey shows that adult awareness of Woodsy's conservation message increased by 13 percent (70 to 83 percent) since 1978.



"Give a hoot! Don't pollute!" echoed throughout the Indianapolis convention hall as Woodsy Owl greeted the Parent Teachers Association National Convention. Woody delivered educational material about how to keep our country clean. Photo by Janet Sledge

Environmental Education—Project Learning Tree. The Forest Service continued its environmental education program for elementary and secondary children through the Western Regional Environmental Education Council and the American Forest Foundation's Project Learning Tree Program. The Program has developed a forest environmental education program that is widely and innovatively used throughout the United States. In 1990, the Boston Project Learning Tree project,

jointly sponsored by the Forest Service and the University of Massachusetts Cooperative Extension 4-H, trained 30 racially diverse educators in how to introduce environmental education effectively to diverse urban student groups.

Media Access—Times Mirror and the Outdoor Writers' Convention. The Forest Service signed a cooperative agreement with Times Mirror Magazines, Inc., publisher of nine national outdoor sport magazines with a readership of 33 million people. The Forest Service shares information on conservation, management issues, and public involvement opportunities with Times Mirror. Times Mirror reports on national forest and grassland activities to increase both public awareness of natural resource management and participation in forest planning, shares readers' opinions with the agency, helps obtain Challenge Cost-Share partners, and works with the agency on information and educational programs for ethical use and enjoyment of natural resources.

Public Affairs sent packets of information on agency programs to each member of the Outdoor Writers' Association. More than 1,000 writers attended the 1990 conference in Salt Lake City, Utah. Forest Service staffs worked to increase interest in the national forests and grasslands and to enhance understanding of management issues through exhibits, speeches, and conversation.

Popular Services

Hotline for Fall Color News. The Fall Color Hotline, a recorded telephone service, has been popular ever since it was instituted in 1988. During 1990, approximately 2,000 people called for information (updated weekly) about fall foliage in various parts of the country and the routes to national forest viewing areas. Television, radio, and print media called about 20 times per week at the height of the season.

The Capitol Christmas Tree. For the past 20 Christmases, trees from the national forests have brought the holiday spirit to the U.S. Capitol grounds. The 1989 (fiscal year 1990) tree, a 61-foot Engelmann spruce, came from the Kootenai National Forest, Libby, MT.

Research Service. The Public Affairs Office established a new unit to monitor public attitudes and advise managers on the status of public opinion on environmental, Federal land management, and workforce diversity issues. Managers used the unit's reports to make decisions that better reflect public views and values.

Audio-Visual Service. Audio-visual materials on Forest Service management activities are available to the public at cost. In 1990, more than 6,500 photographs, slides, films, and videotapes were requested and distributed.



Photo by Carey Given



F.S. Photo



TABLES



	Table No.	Page
National Forest System	1. Summary of National Forest System accomplishments compared to funded output levels and 5-year average--fiscal year 1990	111
	2. National Forest System funding--fiscal year 1990 compared to long-term program costs	112
	3. National Forest System funding--fiscal years 1986-90	114
	4. Summary of National Forest System 1990 accomplishments compared to long-term program trends	116
	5. Draft and final forest plan environmental impact statements filed with the Environmental Protection Agency by Region as of September 30, 1990	117
	6. Planned and accomplished minerals cases by Region--fiscal year 1990	118
	7. Energy mineral workload and production--fiscal years 1986-90	118
	8. Lands administered by the Forest Service as of September 30, 1990	119
	9. Miles of landline location by Region--fiscal year 1990	120
	10. Land acquisition and exchange--fiscal year 1990	120
	11. Fuels treatment acreage accomplished by appropriation--fiscal year 1990	121
	12. Reforestation funding and accomplishments by funding source--fiscal years 1986-90	122
	13. Reforestation program needs--fiscal years 1990-92	123
	14. Reforestation needs as of October 1, 1990, by State, forest, and site productivity class	124
	15. Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--fiscal year 1990	130
	16. Certification of reforestation and timber stand improvement acreages by Region--fiscal year 1990	137
	17. Timber stand improvement funding and accomplishments by funding source--fiscal years 1986-90	138
	18. Timber stand improvement program needs--fiscal years 1990-92	139
	19. Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class	140
	20. Timber offered, sold, unsold, and harvested--fiscal years 1986-90	148
	21. Timber offered, sold, unsold, and harvested by Region--fiscal years 1989-90	149

	Table No.	Page
National Forest System--Continued	22. Timber sold and harvested by State--fiscal year 1990	150
	23. Number of sales, volume, and value of timber sold on National Forest lands by size class--fiscal years 1986-90	151
	24. Uncut timber volume under contract by Region--fiscal years 1986-90	152
	25. Timber sale funding--fiscal years 1986-90	153
	26. Statement of timber sale revenues and expenses--fiscal year 1990	154
	27. Employment, income, and program level account--fiscal year 1990	155
	28. The economic account--fiscal year 1990	156
	29. Activities accomplished with excess timber receipts--fiscal year 1990	157
	30. Range allotment management status by Region--fiscal year 1990	158
	31. Range allotment management status--fiscal years 1986-90	158
	32. Actual grazing use in AUM's by State--fiscal year 1990	159
	33. Annual grazing statistics--fiscal year 1990	160
	34. Range improvements by type--fiscal year 1990	161
	35. Total recreation use on National Forest System lands by State--fiscal years 1986-90	162
	36. State summary of total recreation use on National Forest System lands by activity--fiscal year 1990	164
	37. Trail miles on the National Forest System by State--fiscal years 1988-90	166
	38. Additions to the National Wild and Scenic Rivers System--fiscal year 1990	168
	39. Acres of the National Wilderness Preservation System by State--calendar years 1986-90	169
	40. Additions to the National Wilderness Preservation System--fiscal year 1990	170
	41. Wildlife and fish habitat inventory and improvement by Region--fiscal years 1990	171
	42. Road and bridge construction and reconstruction by State--fiscal year 1990	172
	43. Purchaser election roads constructed by the Forest Service by State--fiscal year 1990	174
	44. Road maintenance by State--fiscal year 1990	176

	Table No.	Page
State and Private Forestry		
	45. State and Private Forestry funding--fiscal year 1990 compared to long-term program costs	178
	46. State and Private Forestry funding--fiscal years 1986-90	179
	47. Summary of State and Private Forestry 1990 accomplishments compared to long-term program levels	180
	48. Wildfires on State and private lands protected under the Cooperative Forestry Assistance Act (P.L. 95-313)--calendar year 1989	182
	49. Pesticide use report--fiscal year 1990	184
	50. Summary of selected cooperative forest management and processing program activities--selected fiscal years	193
	51. Summary of selected cooperative forest management and processing activities by Region--fiscal year 1990	194
	52. Summary of selected cooperative forest management and processing activities by State--fiscal year 1990	196
	53. Small watershed protection accomplishments--fiscal years 1986-90 (P.L. 83-566, Act of 1954)	198
	54. Flood prevention accomplishments--fiscal years 1986-90 (P.L. 78-534, Act of 1944)	198
Forest Research		
	55. Forest Research funding--fiscal year 1990 compared to long-term program trends	199
	56. Forest Research funding--fiscal years 1986-90	200
	57. Extramural research funded through the Forest Service research appropriations--fiscal years 1989-90	201
	58. Research publications by major subject area--fiscal years 1987-90	202
Administration		
	59. Distribution of employees by program and occupational category--selected fiscal years	204
	60. Distribution of employees by tour of duty--selected fiscal years	204
	61. Summary of Forest Service Human Resource Programs--fiscal year 1990	205
	62. Summary statement of receipts and obligations--fiscal years 1989-90	206
	63. Summary statement of values and obligations--fiscal year 1990	208
	64. Statement of receipts--fiscal years 1986-90	210
	65. Statement of receipts--fiscal year 1990	212
	66. Statement of obligations--fiscal year 1990	214
	67. Statement of obligations--fiscal years 1986-90	216

Table 1--Summary of National Forest System accomplishments compared to funded output levels and 5-year average--fiscal year 1990

Resource area	Activity	Units 1/	1990			1986-1990 average accomplishment	1990 as percent of 5-year average
			Funded	Accomplished	Percent of funded		
Resource: Recreation Wilderness Wildlife & fish Range Timber	Visitor use	MM RVD's	255.0	263.1	103	245	108
	Management	MM acres	33.2	33.3	100	33	102
	Habitat improvement	M acres	197.2	495.3	251	272	182
	Permitted grazing use	MM AUM's	9.6	9.6	100	10	99
	Sales offering	B bd. ft.	11.1	11.1	99	11	99
	Silvicultural exams	MM acres	6.1	5.9	97	6	106
	Reforestation 2/						
	Appropriated funds	M acres	109.9	145.0	132	147	99
	K-V funds 3/	M acres	338.6	353.1	104	289	122
	Timber stand improvement						
Soil & water Minerals Support:	Appropriated funds	M acres	166.8	200.3	120	215	93
	K-V funds	M acres	175.1	166.6	95	137	121
	Resource improvements 4/	M acres	21.4	33.3	156	21	162
	Leases and permits	Cases	24,981.0	25,927.0	104	26,550	98
	Trail construction/reconstruction	Miles	1,300.0	1,637.0	126	1,359	120
	Road construction						
	Appropriated funds						
	Construction	Miles	167.0 5/	135.7 6/	81	350	39
	Reconstruction	Miles	517.0 5/	720.9 6/	139	1,025	70
	Purchaser credit						
	Construction 7/	Miles	2,447.0	1,830.0	75	1,891	97
	Reconstruction 7/	Miles	3,706.0	3,832.7	103	3,415	112
	Fuel management 8/	M acres	295.4	305.5	103	322	95
	Land acquired						
	Purchase and donation	M acres	76.0	82.1	108	81	102
	Exchanges	M acres	95.2	151.0	159	135	112
	Landline location	Miles	4,293.0	4,215.0	98	4,730	89

1/ M = thousand, MM = million, B = billion, RVD = recreation visitor day, AUM = animal unit month.

2/ Includes natural regeneration without site preparation.

3/ K-V = Knutson Vandenberg Act.

4/ Includes appropriated funds, excess timber receipt funds, and K-V funds.

5/ Does not include 3.5 miles of construction and 2.9 miles of reconstruction of Tongass Timber Supply Fund miles.

6/ Does not include 0.9 miles of construction and 25.5 miles of reconstruction of Tongass Timber Supply Fund miles.

7/ Includes miles turned back to the Forest Service for construction or reconstruction (purchaser election program).

8/ Does not include acres accomplished through human resource programs and 393,323 acres with brush disposal funds.

Report of the Forest Service

Table 2--National Forest System funding--fiscal year 1990 compared to long-term program costs

	1990 Actual 1/	1995 RPA2/	Percent of 1990 (Actual) to 1995(RPA)
	<i>1,000 constant 1990 dollars</i>		
Minerals area management	28,414	44,000	65
Real estate management	(25,973)	-	N/A 3/
landline location	(30,710)	-	N/A
Real estate management and landline location	56,683	91,000	62
Maintenance of facilities	21,142	29,000	73
Forest fire protection	177,972	197,000	90
Fighting forest fires	611,850	131,000	467
Cooperative law enforcement	11,082	44,000 4/	25
Forest road maintenance	96,384	120,000	80
Recreation use	(153,613) 5/	-	N/A
Forest trail maintenance	(24,459) 5/	-	N/A
Recreation use and trail maintenance	178,072	231,000	77
Sales administration and management	251,796 5/	268,000	94
Reforestation and stand improvement	99,995 6/	71,000	141
Wildlife and fish habitat management	82,559 5/	152,000	54
Range management	(32,966)	-	N/A
Range betterment fund	(4,915)	-	N/A
Range management and range betterment fund	37,881	60,000	63
Soil and water management	61,612 5/	73,000	84
Subtotal	1,715,442	1,511,000	114
General Administration (subtotal)	272,154	331,000	82
Youth Conservation Corps	(1,000)	-	N/A
Construction:			
Construction of facilities 7/	36,185	-	N/A
Forest road construction	164,356	-	N/A
Forest trail construction	18,611 5/	-	N/A
Forest roads purchaser construction 8/	(120,310)	-	N/A
Subtotal	219,152	-	N/A

See footnotes at end of table.

Tables: National Forest System

Table 2--National Forest System funding--fiscal year 1990 compared to long-term program costs—Continued

	1990 Actual 1/ <i>1,000 constant 1990 dollars</i>	1995 RPA2/ <i>1,000 constant 1990 dollars</i>	Percent of 1990 (Actual) to 1995(RPA)
Land acquisition	63,433	-	N/A
Acquisition of lands for Winema NF	0	-	0
Acquisition of lands for National Forests, special acts	1,054	-	N/A
Acquisition of lands to complete land exchange	13	-	N/A
Gifts, donations and bequests	3	-	N/A
Permanent appropriations	638,040	-	N/A
Trust funds	260,137	-	N/A
Subtotal	962,680	-	N/A
Total	3,169,428	N/A	N/A

1/ Post sequestration with supplemental.

2/ Information from 1990 RPA Program.

3/ Not applicable.

4/ Includes NFS, cooperative, and drug enforcement/law enforcement activities.

5/ Includes excess timber receipt dollars.

6/ Includes reforestation trust fund dollars.

7/ Excludes construction of research facilities.

8/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.

Table 3--National Forest System funding--fiscal years 1986-90

	1990 1/	1989	1988	1987	1986
			1,000 dollars		
Minerals area management	28,414	28,439	26,683	27,007	27,164
Real estate management	25,973	25,503	21,834	20,350	19,978
Landline location	30,710	28,678	26,651	26,980	27,399
Maintenance of facilities	21,142	17,553	16,533	15,055	14,124
Forest fire protection	177,792	166,616	165,029	159,388	151,669
Fighting forest fires	611,850	125,000	125,000	125,000	166,652
Cooperative law enforcement	11,082	10,615	9,669	6,675	6,659
Forest road maintenance	96,384	80,729	83,740	63,073	61,856
Forest trail maintenance	24,459	25,185	20,026	11,385	9,537
Sales administration and management	251,796	229,476	185,561	189,640	174,007
Reforestation and stand improvement 2/	99,995	102,597	84,923	90,098	95,433
Recreation use	153,613	149,566	123,742	113,287	99,017
Wildlife and fish habitat management	82,559	79,619	47,444	42,552	37,087
Range management	32,966	30,567	29,225	27,576	26,894
Soil and water management	61,612	57,429	35,271	33,981	30,524
Subtotal	1,710,347	1,157,572	1,001,331	952,047	948,000
General Administration (subtotal)	272,154	272,116	268,660	263,121	251,229
Youth Conservation Corps 3/	(1,000)	(1,000)	(1,000)	(1,000)	(3,234)
Construction					
Construction of facilities 4/	36,185	33,914	24,735	25,663	26,211
Forest road construction	164,356	175,657	171,764	233,310	180,935
Forest trail construction	18,611	18,872	14,671	7,579	6,866
Forest roads purchaser construction 5/	(120,310)	(120,770)	(119,508)	(97,099)	(91,474)
Special projects	0	0	0	10,215 6/	0
Subtotal	219,152	228,443	211,170	276,767	214,012

See footnotes at end of table.

Table 3--National Forest System funding--fiscal years 1986-90--Continued

	1990	1/ 1989	1988	1987	1986
	1,000 dollars				
Land acquisition	63,433	64,205	49,076	52,236	31,356
Acquisition of lands for Winema NF	0	0	0	0	0
Acquisition of lands for National Forests, special acts	1,045	966	966	966	744
Acquisition of lands to complete land exchange	13	335	385	1,573	1,086
Gifts, donations and bequests	3	90	3	27	12
Range betterment	4,915	3,946	3,605	3,807	3,635
Permanent appropriations	638,040	474,117	452,270	359,643	651,533
Trust funds	260,137	267,748	296,334	254,019	202,517
Total	3,169,239	2,469,538	2,283,800	2,164,206	2,304,124

1/ Post sequestration with supplemental.

2/ Includes reforestation trust fund dollars.

3/ Appropriations Act required minimum level of funding from National Forest funds; amounts not included in totals.

1986 - operated a \$3.5 million program from available funds.

1987 - operated a \$3.6 million program from available funds.

1988 - operated a \$3.0 million program from available funds.

1989 - operated a \$2.2 million program from available funds.

4/ Excludes construction of research facilities.

5/ This account was taken off budget in 1982. For comparison, the amounts are shown as non-add items.

6/ Funding for special purposes:

Mt. Elden Work Center - \$0.3 million.

Highway construction Mount St. Helens National Volcanic Monument - \$9.915 million.

Table 4—Summary of National Forest System 1990 accomplishments compared to long-term program trends

Resource area	Activity	Units 1/	1990 Actual	1995 RPA 2/	1989 Actual	Percent of change comparisons		
						1989 Actual to 1990 Actual	1990 Actual to 1995 RPA	
Final output 3/								
Timber	Sales offering	B board ft	11.1	10.8	10.5	5		-2
Recreation	Visitor use 4/	MM RVD's	263.1	308.0	252.5	4		17
Range	Permitted grazing use	MM AUM's	9.6	9.3	9.6	0		-3
Minerals	Applications, proposals, and administration	M cases	25.9	37.9 5/	29.2	-11		46
Wildlife & fish	User-days of recreation	MM WFUD's	42.0	48.9	41.8	0		16
Intermediate output 6/								
Timber	Reforestation	M acres	498.1	416.0	475.9	5		-16
	Timber stand improvement	M acres	366.9	323.0	345.3	6		-12
Wildlife & fish	Habitat improvement	M acres	495.3	- 7/	462.7	7		N/A
Wilderness	Management	MM acres	33.3	35.3	32.5	2		6
Soil & water	Resource improvement 8/	M acres	33.8	46.0	39.2	-14		36
Trails	Construction/reconstruction	Miles	1,637.0	2,396.0 9/	1,724.0	-5		46
Roads	Construction/reconstruction	Miles	6,519.3 10/	7,869.0 11/	5,545.0 10/	18		21
Fire	Fuels management	M acres	712.6 12/	781.0	659.9 12/	8		10
Lands	Purchase and donation	M acres	82.1	- 7/	114.1	-28		N/A

1/ B = billion, MM = million, M = thousand, RVD's = recreation visitor-days, AUM's = animal unit months, WFUD's = wildlife and fish user days.

2/ Information derived from 1990 RPA Program.

3/ Final output = forest and rangeland goods and services purchased or consumed by the private sector or individual consumers.

4/ WFUD's are included in RVD's.

5/ Reported as operations in the 1990 RPA Program.

6/ Intermediate output = work performed by the Forest Service that contributes to the production of final outputs.

7/ These items were not reported in the RPA Program.

8/ Acres accomplished with appropriated funds, excess timber receipt funds, and K-V funds.

9/ Does not include trail reconstruction.

10/ Includes appropriated funds other than Forest Service appropriated and timber receipts.

11/ Includes appropriated and purchaser roads.

12/ Includes appropriated funds, brush disposal funds, and other funds.

Tables: National Forest System

Table 5—Draft and final forest plan environmental impact statements filed with the Environmental Protection Agency
by Region as of September 30, 1990 1/

Northern Region	Rocky Mountain Region	Southwestern Region	Intermountain Region
<i>Final</i>	<i>Final</i>	<i>Final</i>	<i>Final</i>
Flathead (MT)	Rio Grande (CO)	Cibola (NM)	* Bridger-Teton (WY)
Lewis & Clark (MT)	Nebraska (NE)	Tonto (AZ)	* Boise (ID)
Beaverhead (MT)	Bighorn (WY)	Carson (NM)	Uinta (UT)
Helena (MT)	Arapaho-Roosevelt (CO)	Coronado (AZ)	Wasatch-Cache (UT)
Lolo (MT)	Grand Mesa, Uncompahgre, and Gunnison (CO)	Gila (NM)	Targhee (ID)
Bitterroot (MT)	Routt (CO)	Lincoln (NM)	Caribou (ID)
Custer (MT)	San Juan (CO)	Prescott (AZ)	Fishlake (UT)
Deerlodge (MT)	Black Hills (SD)	Apache-Sitgreaves (AZ)	Toiyabe (NV)
Nezperce (ID)	White River (CO)	Coconino (AZ)	Dixie (UT)
Gallatin (MT)	Pike-San Isabel (CO)	Santa Fe (NM)	Humboldt (NV)
Idaho Panhandle (ID)	Medicine Bow (WY)	Kaibab (AZ)	Payette (ID)
Clearwater (ID)	Shoshone (WY)		Challis (ID)
Kootenai (MT)			Ashley (UT)
			Sawtooth (ID)
			Manti-LaSal (UT)
			Salmon (ID)
Pacific Southwest Region	Pacific Northwest Region	Southern Region	Eastern Region
<i>Draft</i>	<i>Final</i>	<i>Final</i>	<i>Final</i>
Stanislaus (CA)	* Deschutes (OR)	Francis Marion (SC)	Hoosier (IN)
Lassen (CA)	* Okanogan (WA)	Sumter (SC)	Nicolet (WI)
Shasta-Trinity (CA)	* Wallowa-Whitman (OR)	Mississippi (MS)	Superior (MN)
Mendocino (CA)	* Wenatchee (WA)	Kisatchie (LA)	Monongahela (WV)
Sierra (CA)	* Olympic (WA)	Chattahoochee-	Chippewa (MN)
Modoc (CA)	* Siuslaw (OR)	Oconee (GA)	Allegheny (PA)
Six Rivers (CA)	* Umatilla (OR)	Daniel Boone (KY)	Huron-Manistee (MI)
	* Gifford Pinchot (WA)	Jefferson (VA)	Chequamegon (WI)
<i>Final</i>	* Mt. Hood (OR)	George Washington (VA)	Mark Twain (MO)
Cleveland (CA)	* Umpqua (OR)	Caribbean (PR)	Hiawatha (MI)
Angeles (CA)	* Malheur (OR)	Cherokee (TN)	Ottawa (MI)
Plumas (CA)	* Rogue River (OR)	Ozark-St. Francis (AR)	White Mountain (NH)
Sequoia (CA)	* Mt. Baker (WA)	Florida (FL)	Green Mountain (VT)
Los Padres (CA)	* Winema (OR)	Ouachita (AR)	Shawnee (IL)
Inyo (CA)	* Willamette (OR)	Alabama (AL)	Wayne (OH)
Eldorado (CA)	Colville (WA)	Croatan-Uwharrie (NC)	
San Bernardino (CA)	Siskiyou (OR)	Nantahala-Pisgah (NC)	
Lake Tahoe Basin	Fremont (OR)	Texas (TX)	
Management Unit (CA)	Ochoco (OR)		
* Tahoe (CA)			
			Alaska Region
			<i>Draft</i>
			Tongass (AK) 2/
			<i>Final</i>
			Chugach (AK)

1/ Includes forest plans filed in previous years.

* Plans filed in 1990.

2/ 1979 Tongass plan under revision.

Report of the Forest Service

Table 6—Planned and accomplished minerals cases by Region--fiscal year 1990

Region	Cases	
	Planned	Accomplished
Northern	4,398	4,268
Rocky Mountain	2,506	2,370
Southwestern	1,217	1,955
Intermountain	2,776	3,307
Pacific Southwest	2,601	3,222
Pacific Northwest	4,480	3,209
Southern	3,987	4,151
Eastern	2,308	2,821
Alaska	708	624
Total	24,981	25,927

Table 7—Energy mineral workload and production--fiscal years 1986-90

Fiscal year	Acres under lease <i>Millions</i>	Oil production <i>Barrels</i>	Gas production <i>1,000 cu.ft.</i>	Coal production <i>Short tons</i>
1986	28.2	13,000,000	180,000,000	21,000,000
1987	23.2	19,000,000	190,000,000	41,200,000
1988	17.8	22,800,000	191,000,000	41,200,000
1989 1/	14.2	20,851,000	204,000,000	65,500,000
1990	12.0	18,000,000	210,000,000	75,000,000

1/ All figures are estimated.

Tables: National Forest System

Table 8—Lands administered by the Forest Service as of September 30, 1990

State, Commonwealth, or Territory 1/	National Forests, purchase units, research areas, and other areas	National Grasslands <i>Acres</i>	Land utilization projects	Total
Alabama				
Alabama	651,695	0	40	651,735
Alaska	22,430,336	0	0	22,430,336
Arizona	11,234,934	0	0	11,234,934
Arkansas	2,499,399	0	0	2,499,399
California	20,545,954	0	18,425	20,564,379
Colorado	13,829,091	612,023	0	14,441,114
Connecticut	24	0	0	24
Florida	1,127,133	0	0	1,127,133
Georgia	858,317	0	0	858,317
Hawaii	1	0	0	1
Idaho	20,389,226	47,749	0	20,436,975
Illinois	265,135	0	0	265,135
Indiana	188,305	0	0	188,305
Kansas	0	108,175	0	108,175
Kentucky	669,530	0	0	669,530
Louisiana	600,764	0	0	600,764
Maine	52,860	0	0	52,860
Michigan	2,814,560	0	959	2,815,519
Minnesota	2,808,518	0	0	2,808,518
Mississippi	1,149,307	0	0	1,149,307
Missouri	1,461,107	0	13,104	1,474,211
Montana	16,799,549	0	0	16,799,549
Nebraska	257,569	94,435	0	352,004
Nevada	5,796,519	0	0	5,796,519
New Hampshire	719,781	0	0	719,781
New Mexico	9,183,877	136,417	240	9,320,534
New York	13,232	0	0	13,232
North Carolina	1,229,112	0	0	1,229,112
North Dakota	743	1,105,046	0	1,105,789
Ohio	198,186	0	0	198,186
Oklahoma	249,985	46,300	0	296,285
Oregon	15,528,886	111,379	856	15,641,121
Pennsylvania	511,767	0	0	511,767
Puerto Rico	27,831	0	0	27,831
South Carolina	607,010	0	0	607,010
South Dakota	1,132,928	862,874	0	1,995,802
Tennessee	626,742	0	0	626,742
Texas	635,687	117,531	0	753,218
Utah	8,098,425	0	0	8,098,425
Vermont	334,571	0	0	334,571
Virgin Islands	147	0	0	147
Virginia	1,641,119	0	0	1,641,119
Washington	9,152,907	0	738	9,153,645
West Virginia	1,025,034	0	0	1,025,034
Wisconsin	1,516,515	0	0	1,516,515
Wyoming	8,682,522	572,211	0	9,254,733
Total	187,546,840	3,814,140	34,362	191,395,342

1/ States not listed have no lands administered by the Forest Service.

Report of the Forest Service

Table 9—Miles of landline location by Region--fiscal year 1990

Region	Total miles boundary	1990 mileage accomplishment	Total miles surveyed
Northern	30,664	493	7,441
Rocky Mountain	51,433	439	5,288
Southwestern	19,991	262	6,511
Intermountain	28,659	285	4,959
Pacific Southwest	29,577	648	12,138
Pacific Northwest	25,627	489	14,445
Southern	42,280	740	37,233
Eastern	42,642	764	9,760
Alaska 1/	1,536	95	1,217
Total	272,409	4,215	98,992

1/ Does not reflect changes due to Alaska Native Claims Settlement Act of 1971 (85 Stat. 688), as amended, and the Alaska Statehood Act of 1958 (72 Stat. 339), as amended. As the land selections are overlapping and/or in a constant state of change, the Region is not keeping track of the boundary changes at this time.

Table 10—Land acquisition and exchange--fiscal year 1990

	Acres	Cases	Value <i>Million dollars</i>
Purchase	81,452	564	63
Exchange	150,994	167	101
Donation	642	16	0.3
Total	233,088	747	164.3

Tables: National Forest System

Table 11—Fuels treatment acreage accomplished by appropriation--fiscal year 1990

Region	Accomplishment			Total
	Forest fire protection	Volunteer and contributed work	Brush disposal funds	
	<i>Acres</i>			
Northern	11,695	596	44,478	56,769
Rocky Mountain	7,468	0	12,498	19,966
Southwestern	37,342	40	64,092	101,474
Intermountain	8,335	0	34,438	42,773
Pacific Southwest	10,618	455	62,270	73,343
Pacific Northwest	24,200	317	172,276	196,793
Southern	201,268	0	0	201,268
Eastern	3,526	0	3,271	6,797
Alaska	450	0	0	450
Total	304,902	1,408	393,323	699,633

Report of the Forest Service

Table 12--Reforestation funding and accomplishments by funding source--fiscal years 1986-90

	Appropriated	Knutson-Vandenberg	Total
1986			
Million dollars 1/	59.4	77.2	136.6
1,000 acres	148.9	215.1	364.0
Constant dollars/acre	398.9	359.1	375.3 2/
1987			
Million dollars 1/	53.7	102.7	156.4
1,000 acres	139.4	254.8	394.2
Constant dollars/acre	385.5	402.9	396.8 2/
1988			
Million dollars 1/	50.8	123.2	174.0
1,000 acres	133.3 3/	282.8 4/	416.1
Constant dollars/acre	380.8	326.0	418.1 2/
1989			
Million dollars 1/	60.1 5/	119.7	179.8
1,000 acres	148.6 6/	327.3	475.9
Constant dollars/acre	404.2	323.2	377.7 2/
1990			
Million dollars 1/	50.4	115.6 7/	166.0
1,000 acres	145.0 8/	353.1	498.1
Constant dollars/acre	347.6	327.0	333.3 2/

1/ All dollars are constant 1990. No General Administration funds included. Does not include funds for nursery and tree improvement.

2/ Weighted average.

3/ Does not include the 24,900 acres of certified natural regeneration without site preparation reported as established in FY 1988.

4/ Does not include the 11,900 acres of certified natural regeneration without site preparation reported as established in FY 1988.

5/ Includes \$9.7 million of resource management excess timber receipts. These funds are to be used to reforest lands damaged by forest fires in 1987 and 1988.

6/ Includes 53,000 acres of certified natural regeneration without site preparation reported as established in FY 1989, but does not include 16,300 acres of other carryover reforestation.

7/ Although \$152 million were authorized, only \$115.6 were obligated. The cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust pool for future obligations.

8/ Includes 59,000 acres of certified natural regeneration without site preparation reported as established in FY 1990.

Tables: National Forest System

Table 13—Reforestation program needs--fiscal years 1990-92

	Current or anticipated	Annual program appropriated funds 1/	
	<i>1,000 acres</i>	<i>1,000 acres</i>	<i>Million dollars</i>
10/1/89 balance	1,225		
Fiscal year 1990:			
New needs 2/	418		
Accomplishments	-498	145.0	50.853
10/1/90 balance	1,144	.	
Fiscal year 1991:			
New needs 2/	450		
Projected accomplishments	-486	126.5	51.026
10/1/91 balance	1,108		
Fiscal year 1992:			
New needs 2/	400		
Projected accomplishments	-449		
10/1/92 balance	1,059		

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451, as amended.

2/ New needs are the results of timber harvests, regeneration failures, and natural disasters such as fires, storms, insects, storms, insects, diseases, and other changes.

Report of the Forest Service

Table 14—Reforestation needs as of October 1, 1990, by State, forest, and site productivity class

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	0-49	50-84	85-119	120+	
Alabama					
NFs in Alabama (subtotal)	67	3,053	2,704	1,083	6,907
Alaska					
Chugach	0	272	0	0	272
Tongass-Chatham	0	663	1,050	3,644	5,357
Tongass-Ketchikan	0	0	424	20,761	21,185
Tongass-Stikine	94	152	2,002	7,458	9,706
Subtotal	94	1,087	3,476	31,863	36,520
Arizona					
Apache-Sitgreaves	337	774	111	0	1,222
Coconino	6,533	3,315	0	0	9,848
Coronado	0	0	0	0	0
Kaibab	3,207	1,770	0	0	4,977
Prescott	0	0	0	0	0
Tonto	31	0	0	0	31
Subtotal	10,108	5,859	111	0	16,078
Arkansas					
Ouachita	193	10,219	9,667	941	21,020
Ozark-St. Francis	65	2,306	608	11	2,990
Subtotal	258	12,525	10,275	952	24,010
California					
Angeles	0	0	0	0	0
Cleveland	0	158	0	0	158
Eldorado	0	127	1,460	3,217	4,804
Inyo	205	143	55	0	403
Klamath	261	6,421	6,177	6,944	19,803
Lake Tahoe Basin	0	0	0	0	0
Lassen		12,961	1,442	1,010	15,413
Los Padres	0	0	0	0	0
Mendocino	221	3,680	2,544	2,232	8,677
Modoc	27	1,619	1,278	574	3,498
Plumas	2	770	10,472	2,867	14,111
Rogue River	0	350	368	0	718
San Bernardino	59	379	37	0	475
Sequoia	0	2,682	1,069	5,788	9,539
Shasta	0	255	214	4,695	5,164
Sierra	0	307	1,557	1,908	3,772
Siskiyou	0	0	1,548	0	1,548
Six Rivers	0	71	2,279	3,533	5,883
Stanislaus	716	5,126	6,883	18,324	31,049

See footnotes at end of table.

Tables: National Forest System

Table 14--Reforestation needs as of October 1, 1990, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	0-49	50-84	85-119	120+	
Tahoe	20	545	1,024	1,989	3,578
Toiyabe	1,219	67	0	0	1,286
Trinity	0	963	2,670	2,074	5,707
Subtotal	2,730	35,661	38,407	53,081	129,879
Colorado					
Arapaho and Roosevelt	8,254	2,663	0	0	10,917
Grand Mesa, Uncompahgre, and Gunnison	4,027	2,145	118	22	6,312
Pike and San Isabel	1,301	228	0	0	1,529
Rio Grande	65	0	0	0	65
Routt	6,543	2,433	282	0	9,258
San Juan	941	2,926	186	0	4,053
White River	0	34	35	0	69
Subtotal	21,131	10,429	621	22	32,203
Florida					
NFs in Florida (subtotal)	14,927	6,654	2,947	889	25,417
Georgia					
Chattahoochee and Oconee (subtotal)	19	612	4,765	1,007	6,403
Idaho					
Boise	1,417	25,251	10,295	2,842	39,805
Caribou	0	548	286	0	834
Challis	0	2	3	0	5
Clearwater	7,024	481	3,407	7,402	18,314
Idaho Panhandle	13,899	2,493	8,111	4,970	29,473
Kootenai	119	40	27	24	210
Lolo	0	21	0	0	21
Nez Perce	2,289	1,366	3,418	1,990	9,063
Payette	1,234	1,714	5,506	35	8,489
Salmon	4,695	4,630	0	0	9,325
Sawtooth	245	502	0	0	747
Targhee	552	12,215	0	26	12,793
Subtotal	31,474	49,263	31,053	17,289	129,079
Illinois					
Shawnee (subtotal)	0	585	191	5	781
Indiana					
Hoosier (subtotal)	0	0	1,147	590	1,737

See footnotes at end of table.

Report of the Forest Service

Table 14—Reforestation needs as of October 1, 1990, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	0-49	50-84	85-119	120+	
Kentucky					
Daniel Boone (subtotal)	13	31	5,034	430	5,508
Louisiana					
Kisatchie (subtotal)	0	1,108	2,431	6,499	10,038
Maine					
White Mountain (subtotal)	105	114	45	12	276
Michigan					
Hiawatha	1,371	863	466	45	2,745
Huron-Manistee	2,982	3,951	473	10	7,416
Ottawa	2,130	10,373	661	185	13,349
Subtotal	6,483	15,187	1,600	240	23,510
Minnesota					
Chippewa	211	0	197	41	449
Superior	1,198	1,642	348	46	3,234
Subtotal	1,409	1,642	545	87	3,683
Mississippi					
NFs in Mississippi (subtotal)	219	3,126	7,252	9,057	19,654
Missouri					
Mark Twain (subtotal)	0	13,620	101	15	13,736
Montana					
Beaverhead	930	1,010	0	0	1,940
Bitterroot	2,870	1,401	589	33	4,893
Custer	2,523	593	260	0	3,376
Deerlodge	744	228	253	0	1,225
Flathead	11,152	1,140	2,760	883	15,935
Gallatin	1,517	1,108	33	0	2,658
Helena	3,434	229	45	0	3,708
Kootenai	15,618	5,841	10,414	1,857	33,730
Lewis and Clark	1,818	172	46	0	2,036
Lolo	6,585	3,465	2,036	270	12,356
Subtotal	47,191	15,187	16,436	3,043	81,857
New Hampshire					
White Mountain (subtotal)	1,276	2,775	481	135	4,667
New Mexico					
Carson	67	102	0	0	169
Cibola	952	0	0	0	952

See footnotes at end of table.

Tables: National Forest System

Table 14--Reforestation needs as of October 1, 1990, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	0-49	50-84	85-119	120+	
Gila	0	0	0	0	0
Lincoln	19	1,523	0	0	1,542
Santa Fe	1,161	0	0	0	1,161
Subtotal	2,199	1,625	0	0	3,824
New York Green Mountain (subtotal)	0	0	72	0	72
North Carolina NFs in North Carolina (subtotal)	344	2,575	434	620	3,973
Ohio Wayne (subtotal)	0	73	1,020	1,339	2,432
Oklahoma Ouachita (subtotal)	0	478	367	0	845
Oregon Deschutes	8,126	12,954	1,931	839	23,850
Fremont	5,399	3,390	905	8	9,702
Klamath	10	123	116	182	431
Malheur	3,200	16,680	0	0	19,880
Mt. Hood	512	15,104	7,612	2,709	25,937
Ochoco	18,290	4160	142	0	22,592
Rogue River	0	4,074	9,103	176	13,353
Siskiyou	0	84	5,196	1,325	6,605
Siuslaw	0	0	0	2,955	2,955
Umatilla	1,033	15,185	713	0	16,931
Umpqua	5	354	8,500	3,250	12,109
Wallowa-Whitman	11,821	38,670	10,273	40	60,804
Willamette	36	1,402	4,739	12,942	19,119
Winema	5,691	2,674	2,484	1,571	12,420
Subtotal	54,123	114,854	51,714	25,997	246,688
Pennsylvania Allegheny (subtotal)	4,040	2,600	0	0	6,640
Puerto Rico Caribbean (subtotal)	0	0	41	118	159
South Carolina Francis Marion and Sumpter (subtotal)	392	7,179	26,798	48,523	82,892
South Dakota Black Hills (subtotal)	14,540	7,331	0	0	21,871

See footnotes at end of table.

Report of the Forest Service

Table 14—Reforestation needs as of October 1, 1990, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	0-49	50-84	85-119	120+	
Tennessee					
Cherokee (subtotal)	5	1,746	1,313	4,547	7,611
Texas					
NFs in Texas (subtotal)	0	5,028	7,990	3,749	16,767
Utah					
Ashley	48,776	16,739	0	0	65,515
Dixie	1,292	2,268	0	0	3,560
Fishlake	294	482	0	0	776
Manti-LaSal	0	490	100	0	590
Uinta	0	0	0	0	0
Wasatch-Cache	435	447	0	0	882
Subtotal	50,797	20,426	100	0	71,323
Vermont					
Green Mountain (subtotal)	87	215	152	0	454
Virginia					
George Washington	1,339	434	109	185	2,067
Jefferson	50	2,881	286	290	3,507
Subtotal	1,389	3,315	395	475	5,574
Washington					
Colville	1,836	9,515	3,327	0	14,678
Gifford Pinchot	0	7,255	9,760	2,549	19,564
Idaho Panhandle	247	0	979	165	1,391
Mt. Baker-Snoqualmie	0	797	1,670	1,377	3,844
Okanogan	4,277	4,575	1,459	0	10,311
Olympic	0	722	3,719	3,009	7,450
Umatilla	32	768	209	0	1,009
Wenatchee	100	1,685	3,577	91	5,453
Subtotal	6,492	25,317	24,700	7,191	63,700
West Virginia					
George Washington	174	50	2	222	448
Jefferson	0	0	0	0	0
Monongahela	0	300	300	300	900
Subtotal	174	350	302	522	1,348

See footnotes at end of table.

Tables: National Forest System

Table 14—Reforestation needs as of October 1, 1990, by State, forest, and site productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	Acres by site productivity class 2/				Total acres
	0-49	50-84	85-119	120+	
Wisconsin					
Chequamegon	0	3,280	452	125	3,857
Nicolet	762	3,998	866	559	6,185
Subtotal	762	7,278	1,318	684	10,042
Wyoming					
Bighorn	1,509	1,306	0	0	2,815
Black Hills	7,235	6,668	38	0	13,941
Bridger-Teton	0	1,227	2,039	0	3,266
Medicine Bow	4,983	434	0	0	5,417
Shoshone	0	635	134	0	769
Targhee	0	105	0	0	105
Wasatch	0	0	0	0	0
Subtotal	13,727	10,375	2,211	0	26,313
Total	286,575	389,283	248,549	220,064	1,144,471

1/ Site productivity class refers to the amount of wood produced in cubic feet per acre per year in a natural unmanaged stand.

2/ States not listed had no reforestation needs as of October 1, 1990.

Table 15--Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--
fiscal year 1990

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber stand improvement			
	Artificial regeneration		Natural regeneration		Fertili- zation		Pruning	
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Release	Thinning	Total	Total
Acres								
Alabama								
NFs in Alabama (subtotal)	5,007	0	1,151	0	3,508	0	0	3,508
Alaska								
Chugach	0	0	0	167	0	0	0	0
Tongass-Chatham	622	0	0	1,582	0	347	0	347
Tongass-Ketchikan	25	0	369	3,016	0	1,141	0	1,141
Tongass-Stikine	196	0	0	2,194	0	1,415	0	1,415
Subtotal	843	0	369	6,959	0	2,903	0	2,903
Arizona								
Apache-Sitgreaves	24	0	0	0	0	853	0	853
Coconino	358	0	0	0	0	2,422	0	2,422
Kaibab	186	0	0	62	0	1,214	0	1,214
Tonto	8	0	0	0	0	0	0	0
Subtotal	576	0	0	62	0	4,489	0	4,489
Arkansas								
Ouachita	12,181	0	989	302	3,888	459	0	4,347
Ozark-St. Francis	1,826	0	3,687	0	2,572	982	0	3,554
Subtotal	14,007	0	4,676	302	6,460	1,441	0	7,901
California								
Angeles	15	0	0	0	0	0	0	0
Eldorado	378	0	0	0	1,230	561	0	1,791
Klamath	9,918	0	0	18	12	0	0	12
Mendocino	603	0	0	0	108	0	0	108
Modoc	37	0	0	0	0	0	0	0
Plumas	979	0	0	30	0	0	0	0
Rogue River	687	0	0	0	0	0	0	0
San Bernardino	37	0	0	0	0	0	0	0
Sequoia	264	0	0	0	0	0	0	0
Shasta	515	0	0	180	0	0	0	0

See footnotes at end of table.

Table 15--Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--
fiscal year 1990--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation										Timber stand improvement			
	Artificial regeneration		Natural regeneration		Total		Release		Thinning		Ferti- zation		Pruning	
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Acres	Release	Thinning	Ferti- zation	Pruning	Total			
Sierra	548	0	0	0	548		0	0	0	0	0	0	0	0
Siskiyou	206	0	0	0	206		186	186	0	0	0	0	0	372
Six Rivers	1,481	0	0	0	1,481		0	0	0	0	0	0	0	0
Stanislaus	280	0	0	0	280		498	123	0	0	0	0	0	621
Tahoe	1,211	0	41	0	1,252		0	0	0	0	0	0	0	0
Trinity	3,221	0	0	0	3,221		2,159	322	0	0	0	0	0	2,481
Subtotal	20,380	0	41	228	20,649		4,193	1,192	0	0	0	0	0	5,385
Colorado														
Arapaho and Roosevelt	0	0	178	2,995	3,173		28	489	0	0	0	0	0	517
Grand Mesa, Uncompahgre, and Gunnison	66	0	0	725	791		363	0	0	0	0	0	0	363
Pike and San Isabel	19	19	401	329	768		0	297	0	0	0	0	0	297
Rio Grande	0	0		2,262	2,262		0	0	0	0	0	0	0	0
Routt	23	11	716	1,321	2,071		214	50	0	0	0	0	0	264
San Juan	655	0	90	623	1,368		251	525	0	0	0	0	0	776
White River	53	0	10	871	934		880	46	0	0	0	0	0	926
Subtotal	816	30	1,395	9,126	11,367		1,736	1,407	0	0	0	0	0	3,143
Florida														
NFs in Florida (subtotal)	8,215	2,316	241	89	10,861		235	0	3,796	0	0	0	0	4,031
Georgia														
Chattahoochee- Oconee (subtotal)	3,194	0	781	296	4,271		3,715	250	410	0	0	0	0	4,375
Idaho														
Boise	0	0	12	41	53		0	336	0	0	0	0	0	336
Challis	104	0	0	0	104		0	0	0	0	0	0	0	0
Clearwater	1,264	0		49	1,313		258	943	421					1,622
Idaho Panhandle	5,727	0	801	921	7,449		1,534	3,107	343	141				5,125
Nez Perce	3,636	0	210	1,257	5,103		155	735	0	0	0	0	0	890
Payette	0	0	0	0	0		0	1,525	0	0	0	0	0	1,525

See footnotes at end of table.

Table 15--Reforestation and timber stand improvement acres certified as satisfactorily stocked by State and National Forest--
fiscal year 1990--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber stand improvement			
	Artificial regeneration		Natural regeneration		Release	Thinning	Fertili- zation	Pruning
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/				
Acres								
Salmon Targhee	0 1,506	0 0	0 379	652 0	0 0	428 940	0 0	0 0
Subtotal	12,237	0	1,402	2,920	16,559	8,014	764	141
10,866								
Illinois Shawnee (subtotal)	216	0	316	0	532	0	0	10
175								
Indiana Wayne-Hoosier (subtotal)	150	0	863	0	1,013	0	0	0
415								
Kentucky Daniel Boone (subtotal)	1,525	0	4,689	0	6,214	686	0	45
1,153								
Louisiana Kisatchie (subtotal)	6,274	0	466	707	7,447	1,026	0	0
1,362								
Maine White Mountain (subtotal)	15	0	130	75	220	0	0	0
0								
Michigan Hiawatha	992	198	1,634	363	3,187	543	0	341
884								
Huron-Manistee	1,153	0	896	385	2,434	404	0	47
934								
Ottawa	531	0	3,460	3825	7,816	895	0	0
895								
Subtotal	2,676	198	5,990	4,573	13,437	1,842	0	388
2,713								
Minnesota Chippewa	1,044	53	4,747	181	6,025	2,396	0	13
2,409								
Superior	2,330	1,016	4,091	5,336	12,773	1,666	0	0
1,775								
Subtotal	3,374	1,069	8,838	5,517	18,798	4,062	0	13
4,184								
Mississippi NFs in Mississippi (subtotal)	17,942	0	1,648	124	19,714	4,414	2,580	0
7,472								

See footnotes at end of table.

Table 15--Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--
fiscal year 1990--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement					
	Artificial regeneration		Natural regeneration			Total	Release	Thinning	Ferti- zation	Pruning	Total
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Acres						
Missouri Mark Twain (subtotal)	2,184	33	11,363	9	13,589	1,374	293	0	0	1,667	
Montana											
Beaverhead	47	0	1,380	441	1,868	381	674	0	0	1,055	
Bitterroot	3,461	0	99	179	3,739	249	621	0	0	870	
Custer	0	0	0	161	161	122	184	0	0	306	
Deerlodge	0	0	0	0	0	302	272	0	0	574	
Flathead	505	0	220	215	940	467	1,350	0	0	1,817	
Gallatin	1,634	6	80	261	1,981	0	686	0	0	686	
Helena	1,281	0	131	390	1,802	101	252	0	0	353	
Idaho Panhandle	0	0	0	0	0	51	0	0	0	51	
Kootenai	1,761	0	422	2,184	4,367	65	3,974	0	0	4,039	
Lewis and Clark	316	0	802	208	1,326	72	268	0	0	340	
Lolo	3,703	72	760	818	5,353	54	585	0	0	639	
Subtotal	12,708	78	3,894	4,857	21,537	1,864	8,866	0	0	10,730	
New Hampshire White Mountain (subtotal)	82	0	1,586	504	2,172	178	0	0	0	178	
New Mexico											
Carson	0	0	0	0	0	0	1,906	0	0	1,906	
Cibola	546	0	0	0	546	0	298	0	0	298	
Gila	0	0	0	141	141	0	0	0	0	0	
Subtotal	546	0	0	141	687	0	2,204	0	0	2,204	
North Carolina NFs in North Carolina (subtotal)	1,988	0	3,290	0	5,278	1,646	0	0	0	1,646	
Ohio Wayne-Hoosier (subtotal)	370	0	418	0	788	486	0	0	2	488	
Oklahoma Ouachita (subtotal)	2,426	0	0	70	2,496	0	109	0	0	109	

See footnotes at end of table.

Report of the Forest Service

Table 15—Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--
fiscal year 1990--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber stand improvement			
	Artificial regeneration		Natural regeneration		Ferti-		Pruning	
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Release	Thinning	zation	Total
Acres								
Oregon								
Deschutes	3,903	0	0	0	0	11,680	0	11,680
Fremont	3,515	0	0	60	0	2,552	0	2,552
Malheur	897	0	62	197	0	8,824	0	8,824
Mt. Hood	5,489	0	345	145	0	1,392	938	2,330
Ochoco	1,793	0	188	167	0	0	0	0
Rogue River	6,722	0	0	0	139	279	0	418
Siskiyou	3,366	0	90	1	1,246	2,063	0	3,309
Siuslaw	2,154	0	0	0	6,166	4,286	637	11,089
Umatilla	5,883	0	449	1,177	0	1,553	0	1,553
Umpqua	8,510	0	0	244	224	2,690	5,329	8,243
Wallowa-Whitman	1,542	0	1303	2,791	240	947	0	1,187
Willamette	10,539	0	0	274	723	4,728	6,255	12,367
Winema	913	0	0	0	0	0	0	0
Subtotal	55,226	0	2,437	5,056	8,738	40,994	13,159	63,552
Pennsylvania								
Allegheny (subtotal)	0	0	998	599	0	0	0	0
South Carolina								
Francis Marion and Sumter (subtotal)	4,892	23	1,529	0	1,258	698	859	2,815
South Dakota								
Black Hills (subtotal)	45	0	36	1,729	0	16,836	0	16,836
Tennessee								
Cherokee (subtotal)	1,885	107	1,121	23	2,445	214	0	2,659
Texas								
NFs in Texas (subtotal)	5,756	0	389	355	176	1,073	0	1,249

See footnotes at end of table.

Table 15--Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--
fiscal year 1990--Continued

State, Commonwealth, or Territory 1/ National Forest	Reforestation					Timber stand improvement				
	Artificial regeneration		Natural regeneration			Release		Fertilization		
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/	Total	Thinning	Pruning	Total	Thinning	Pruning
Acres										
Utah										
Ashley	0	0	0	0	0	0	0	0	0	0
Wasatch	0	0	3,247	0	3,247	0	0	0	0	0
Subtotal	0	0	3,247	0	3,247	0	0	0	0	0
Vermont										
Green Mountain (subtotal)	82	0	363	0	445	184	26	0	0	210
Virginia										
George Washington	954	0	2,011	657	3,622	812	0	0	0	812
Jefferson	253	0	1,626	0	1,879	787	213	0	0	1,000
Subtotal	1,207	0	3,637	657	5,501	1,599	213	0	0	1,812
Washington										
Colville	3,491	0	30	145	3,666	0	1,123	0	0	1,123
Gifford Pinchot	6,051	0	0	177	6,228	265	6,961	0	208	7,434
Idaho Panhandle	549	0	32	60	641	0	60	0	0	60
Mt. Baker-Snoqualmie	1,884	0	0	802	2,686	0	1,420	542	0	1,962
Okanogan	80	0	103	2,010	2,193	0	0	0	0	0
Olympic	6,500	0	0	622	7,122	360	1,791	2,232	0	4,383
Umatilla	218	0	235	0	453	0	659	0	0	659
Wenatchee	607	0	0	3,617	4,224	0	0	0	0	0
Subtotal	19,380	0	400	7,433	27,213	625	12,014	2,774	208	15,621
West Virginia										
George Washington	0	0	0	0	0	83	0	0	0	83
Monongahela	25	0	994	158	1,177	196	0	0	0	196
Subtotal	25	0	994	158	1,177	279	0	0	0	279

See footnotes at end of table.

Table 15--Reforestation and timber stand improvement acreages certified as satisfactorily stocked by State and National Forest--
fiscal year 1990--Continued

fiscal year 1990--Continued										
State, Commonwealth, or Territory 1/ National Forest	Reforestation				Timber stand improvement					
	Artificial regeneration		Natural regeneration		Total	Release	Thinning	Fertili- zation	Pruning	Total
	Planted	Seeded	w/site prep. 2/	w/o site prep. 2/						
Acres										
Wisconsin										
Chequamegon	1,311	40	4,346	283	5,980	1,145	0	0	0	1,145
Nicolet	854	0	3,818	3,762	8,434	1,334	0	0	0	1,334
Subtotal	2,165	40	8,164	4,045	14,414	2,479	0	0	0	2,479
Wyoming										
Big Horn	0	40	60	182	282	0	106	0	0	106
Black Hills	0	0	0	0	0	0	379	0	0	379
Medicine Bow	20	0	2,252	499	2,771	460	851	0	0	1,311
Shoshone	0	0	0	2,049	2,049	0	0	0	0	0
Targhee	925	0	0	0	925	0	0	0	0	0
Subtotal	945	40	2,312	2,730	6,027	460	1,336	0	0	1,796
Total	209,359	3,934	79,174	59,344	351,811	58,195	108,842	22,240	1,468	190,745

1/ States not listed had no certification in fiscal year 1990.

2/ w/ site prep. = with site preparation; w/o site prep. = without site preparation.

Table 16--Certification of reforestation and timber stand improvement acreages by Region--fiscal year 1990

Region	Reforestation				Total	Timber stand improvement				
	Planted	Seeded	Natural regeneration			Release	Precom- mercial thinning	Fertili- zation	Pruning	
			With site preparation	Without site preparation						
Acres										
Northern	23,884	78	4,937	7,144	36,043	3,811	13,711	764	141	18,427
Rocky Mountain	881	70	3,743	13,585	18,279	2,196	19,579			21,775
Southwest	1,122			203	1,325		6,693			6,693
Intermountain	2,535		3,638	693	6,866		3,569			3,569
Pacific Southwest	19,487		41	228	19,756	4,007	1,006			5,013
Pacific Northwest	74,950		2,805	12,429	90,184	9,549	53,134	15,933	869	79,485
Southern	74,318	2,446	23,618	2,623	103,005	27,251	7,336	5,543	45	40,175
Eastern	11,339	1,340	40,023	15,480	68,182	11,381	911		413	12,705
Alaska	843		369	6,959	8,171		2,903			2,903
Total	209,359	3,934	79,174	59,344	351,811	58,195	108,842	22,240	1,468	190,745

Report of the Forest Service

Table 17--Timber stand improvement funding and accomplishments by funding source--fiscal years 1986-90

	Appropriated	Knutson-Vandenberg	Total
1986			
Million dollars 1/	33.4	21.6	55.0
1,000 acres	259.4	100.7	360.1
Constant dollars/acre	128.7	214.9	152.8 2/
1987			
Million dollars 1/	30.6	31.5 3/	59.8 3/
1,000 acres	222.7 4/	134.2	356.9 4/
Constant dollars/acre	137.5 4/	234.9	167.6 4/
1988			
Million dollars 1/	25.1	33.6 5/	58.6 5/
1,000 acres	199.0	138.2	337.2
Constant dollars/acre	125.9	243.0	173.9 5/
1989			
Million dollars 1/	33.5	36.6 5/	70.1
1,000 acres	196.9 6/	146.1	343.0
Constant dollars/acre	170.1	250.5	204.4 2/
1990			
Million dollars 1/	29.8	30.3	60.1
1,000 acres	200.3 7/	166.6	366.9
Constant dollars/acre	148.8	181.9	163.8

1/ All dollars are constant 1990. No General Administration funds included. Does not include funds for nursery and tree improvement.

2/ Weighted average.

3/ Although \$30.3 million had been authorized, only \$20.9 million were obligated and the cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligation.

4/ Accomplishments and costs include the \$3.4 million and 8,431 acres done with Tongass timber funds.

5/ Although \$34.9 million had been authorized, only \$25.6 million were obligated. The cost/acre is based upon the obligated amount. The unspent funds were returned to the K-V trust fund pool for future obligation.

6/ Does not include 2,314 acres in Tongass Timber Supply fund.

7/ Includes 3,346 acres performed with carryover TSI funds.

Tables: National Forest System

Table 18--Timber stand improvement program needs--fiscal years 1990-92

	Work needs	Annual program, appropriated funds 1/	
	<i>1,000 acres</i>	<i>1,000 acres</i>	<i>Million dollars</i>
10/1/89 balance	1,222 2/		
Fiscal year 1990:			
New needs	359		
Accomplishments contributed 2/	-367	200.3	29.1
10/1/90 balance	1,214		
Fiscal year 1991:			
New needs	350		
Projected accomplishments	-357	161.0	32.0
10/1/91 balance	1,207		
Fiscal year 1992:			
New needs	325		
Projected accomplishments	-328		
10/1/92 balance	1,204.0		

1/ Includes Reforestation Trust Fund pursuant to P.L. 96-451, as amended.

2/ This represents over 4 years of future accomplishments.

Table 19—Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement Cubic foot productivity classes 2/ Acres					Total	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	0-49	50-84	85-119	120+						
Alabama										
NFs in Alabama (subtotal)	235	2,493	2,351	360		5,439	5,364	75	0	0
Alaska										
Chugach	0	26	404	0		430	0	430	0	0
Tongass-Chatham	0	0	864	2,285		3,149	1,812	1,337	0	0
Tongass-Ketchikan	0	0	0	36,877		36,877	1,138	35,739	0	0
Tongass-Stikine	30	10	199	9,430		9,669	0	9,669	0	0
Subtotal	30	36	1,467	48,592		50,125	2,950	47,175	0	0
Arizona										
Apache-Sitgreaves	2,021	3,240	0	0		5,261	0	5,261	0	0
Coconino	2,874	738	0	0		3,612	0	3,612	0	0
Coronado	0	0	0	0		0	0	0	0	0
Kaibab	1,235	343	0	0		1,578	0	1,578	0	0
Prescott	0	0	0	0		0	0	0	0	0
Tonto	0	0	0	0		0	0	0	0	0
Subtotal	6,130	4,321	0	0		10,451	0	10,451	0	0
Arkansas										
Ouachita	1,043	9,479	283	100		10,905	6,423	4,482	0	0
Ozark-St. Francis	232	1,752	190	70		2,244	457	1,787	0	0
Subtotal	1,275	11,231	473	170		13,149	6,880	6,269	0	0
California										
Angeles	56	319	135	0		510	406	81	0	23
Cleveland	0	707	0	0		707	511	195	0	1
Eldorado	86	878	7,953	14,140		23,057	17,977	5,022	58	0
Inyo	0	0	0	0		0	0	0	0	0
Klamath	414	13,218	20,602	12,893		47,127	37,792	9,312	23	0
Lake Tahoe Basin	0	0	0	0		0	0	0	0	0
Lassen	0	70,272	6,435	1,489		78,196	26,348	51,848	0	0
Los Padres	0	0	0	0		0	0	0	0	0
Mendocino	305	12,379	11,552	8,022		32,258	20,071	10,945	1,242	0
Modoc	163	8,958	2,951	1,376		13,448	6,126	7,322	0	0

See footnotes at end of table.

Table 19--Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement					Total	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	Cubic foot productivity classes 2/									
	0-49	50-84	85-119	120+	Acres					
Plumas	44	798	12,386	5,025	18,253	2,338	15,915	0	0	0
Rogue River	0	171	0	0	171	146	25	0	0	0
San Bernardino	276	2,486	150	66	2,978	1,202	1,756	0	20	20
Sequoia	33	2,478	2,034	9,009	13,554	11,160	1,504	672	218	218
Shasta	0	111	123	20,303	20,537	18,292	2,245	0	0	0
Sierra	134	1,026	4,523	7,007	12,690	10,055	2,635	0	0	0
Siskiyou	0	0	970	0	970	808	0	162	0	0
Six Rivers	0	168	5,058	12,830	18,056	14,620	3,382	54	0	0
Stanislaus	1,435	12,003	18,565	51,092	83,095	57,437	25,658	0	0	0
Tahoe	0	1,517	3,205	11,740	16,462	11,133	5,329	0	0	0
Toiyabe	2,956	1,643	0	0	4,599	2,462	2,137	0	0	0
Trinity	0	892	2,565	3,624	7,081	6,817	264	0	0	0
Subtotal	5,902	130,024	99,207	158,616	393,749	245,701	145,575	2,211	262	262
Colorado										
Arapahoe-Roosevelt	3,210	4,140	0	0	7,350	440	6,910	0	0	0
Grand Mesa, Uncompahgre, and Gunnison	3,510	499	0	0	4,009	943	3,066	0	0	0
Manti-LaSal	0	0	95	0	95	0	95	0	0	0
Pike and San Isabel	2,170	408	0	0	2,578	1,609	969	0	0	0
Rio Grande	2,055	19,521	3,368	0	24,944	14,708	10,236	0	0	0
Routt	6,423	1,068	318	0	7,809	475	7,334	0	0	0
San Juan	1,843	2,073	0	0	3,916	3,614	302	0	0	0
White River	420	386	1,126	0	1,932	1,619	313	0	0	0
Subtotal	19,631	28,095	4,907	0	52,633	23,408	29,225	0	0	0
Florida										
NFs in Florida (subtotal)	456	1,759	1,790	41	4,046	133	485	3,428	0	0
Georgia										
Chattahoochee and Oconee (subtotal)	0	1,987	4,754	2,668	9,409	3,462	5,647	300	0	0

See footnotes at end of table.

Table 19—Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement					Total	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	Cubic foot productivity classes 2/ Acres									
	0-49	50-84	85-119	120+						
Idaho										
Boise	923	1,255	4,497	1,149	7,824	3,115	4,709	0	0	
Caribou	0	1,681	47	0	1,728	1,296	432	0	0	
Challis	110	714	0	0	824	110	714	0	0	
Clearwater	2,137	140	1,049	3,315	6,641	1,006	5,635	0	0	
Idaho Panhandle	3,857	2,713	10,179	10,365	27,114	5,382	21,732	0	0	
Kootenai	124	0	273	219	616	99	517	0	0	
Nez Perce	199	863	1,707	933	3,702	1,241	2,461	0	0	
Payette	689	2,750	5,811	412	9,662	1,322	8,340	0	0	
Salmon	2,371	2,940	0	0	5,311	3,558	1,753	0	0	
Sawtooth	396	24	0	0	420	152	268	0	0	
Targhee	5	642	0	0	647	608	39	0	0	
Subtotal	10,811	13,722	23,563	16,393	64,489	17,889	46,600	0	0	
Illinois										
Shawnee (subtotal)	0	50	141	0	191	138	0	0	53	
Indiana										
Hoosier (subtotal)	0	402	992	4,170	5,564	2,151	1,385	0	2,028	
Kentucky										
Daniel Boone (subtotal)	40	2,664	5,225	746	8,675	2,591	6,031	3	50	
Louisiana										
Kisatchie (subtotal)	0	160	890	872	1,922	1,210	712	0	0	
Maine										
White Mountain (subtotal)	21	92	63	13	189	130	59	0	0	
Michigan										
Hiawatha	398	2,836	2,602	28	5,864	609	883	0	4,372	
Huron-Manistee	1,541	3,366	709	0	5,616	3,453	2,102	0	61	
Ottawa	66	61	716	15	858	858	0	0	0	
Subtotal	2,005	6,263	4,027	43	12,338	4,920	2,985	0	4,433	

See footnotes at end of table.

Table 19—Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement				Total	Release subtotal	Thinning subtotal	Ferti- lization subtotal	Pruning subtotal
	Cubic foot productivity classes 2/								
	0-49	50-84	85-119	120+					
Acres									
Minnesota									
Chippewa	0	77	340	0	417	0	0	0	417
Superior	3,812	0	69	38	3,919	3,919	0	0	0
Subtotal	3,812	77	409	38	4,336	3,919	0	0	417
Mississippi									
NFs in Mississippi (subtotal)	585	1,357	920	6,795	9,657	6,725	2,087	845	0
Missouri									
Mark Twain (subtotal)	504	12,527	221	0	13,252	5,018	8,149	0	85
Montana									
Beaverhead	5,507	819	492	38	6,856	550	6,306	0	0
Bitterroot	2,250	222	1,046	72	3,590	1,215	2,375	0	0
Custer	1,778	5	25	0	1,808	1,153	655	0	0
Deerlodge	7,354	2,554	545	70	10,523	1,170	9,353	0	0
Flathead	2,131	4,404	10,497	3,538	20,570	1,178	19,312	62	18
Gallatin	437	1,131	285	133	1,986	53	1,933	0	0
Helena	2,261	502	599	12	3,374	435	2,929	10	0
Idaho Panhandle	10	0	95	15	120	10	110	0	0
Kootenai	3,360	6,503	19,338	6,850	36,051	926	34,999	0	126
Lewis and Clark	1,236	1,174	806	0	3,216	108	3,108	0	0
Lolo	1,295	2,456	2,712	382	6,845	146	6,692	0	7
Subtotal	27,619	19,770	36,440	11,110	94,939	6,944	87,772	72	151
New Hampshire									
White Mountain (subtotal)	194	121	216	24	555	248	307	0	0

See footnotes at end of table.

Table 19—Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement				Total	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	Cubic foot productivity classes 2/ Acres								
	0-49	50-84	85-119	120+					
New Mexico									
Carson	252	81	0	0	333	0	333	0	0
Cibola	2,092	0	0	0	2,092	698	1,394	0	0
Gila	0	0	0	0	0	0	0	0	0
Lincoln	0	3,579	0	0	3,579	0	3,579	0	0
Santa Fe	1,301	0	0	0	1,301	0	1,301		0
Subtotal	3,645	3,660	0	0	7,305	698	6,607	0	0
Nevada									
NFs in Nevada (subtotal)	0	0	0	0	0	0	0	0	0
New York									
Finger Lakes (subtotal)	0	141	719	0	860	60	800	0	0
North Carolina									
NFs in North Carolina (subtotal)	129	2,197	1,019	2,114	5,459	3,781	1,190	488	0
Ohio									
Wayne (subtotal)	26	690	708	2,526	3,950	1,344	1,261	0	1,345
Oklahoma									
Ouachita (subtotal)	0	619	175	55	849	510	339	0	0
Oregon									
Deschutes	6,343	5,974	537	105	12,959	813	12,146	0	0
Fremont	17,175	7,115	378	0	24,668	9,951	14,617	0	100
Klamath	0	193	740	1,197	2,130	1,205	925	0	0
Malheur	6,520	10,800	0	0	17,320	616	16,704	0	0
Mt. Hood	346	10,354	18,300	4,139	33,139	661	17,134	14,331	1,013
Ochoco	10,339	3,499	12	0	13,850	170	13,152	0	528
Rogue River	0	995	9,165	1,111	11,271	7,949	1,451	1,871	0
Siskiyou	0	1,651	26,413	5,110	33,174	17,585	9,856	5,733	0
Siuslaw	0	0	0	9,166	9,166	5,004	2,417	1,550	195
Umatilla	282	832	0	0	1,114	155	884	0	75
Umpqua	0	5,436	28,094	9,068	42,598	4,686	16,429	21,483	0
Wallowa-Whitman	1,831	7,356	2,511	0	11,698	3,847	7,851	0	0

See footnotes at end of table.

Table 19--Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement					Total	Release subtotal	Thinning subtotal	Ferti- zation subtotal	Pruning subtotal
	Cubic foot productivity classes 2/									
	0-49	50-84	85-119	120+	Acres					
Willamette Winema	0 18,048	1,294 6,900	13,973 18	19,508 2		34,775 24,968	3,946 1,561	12,041 23,407	17,350 0	1,438 0
Subtotal	60,884	62,399	100,141	49,406		272,830	58,149	149,014	62,318	3,349
Puerto Rico Caribbean (subtotal)	0	300	639	0		939	339	600	0	0
South Carolina Francis Marion & Sumter (subtotal)	0	40	6,226	8,693		14,959	5,916	1,470	7,573	0
South Dakota Black Hills Custer	4,731 30	713 0	15 0	0 0		5,459 30	0 0	5,459 30	0 0	0 0
Subtotal	4,761	713	15	0		5,489	0	5,489	0	0
Tennessee Cherokee (subtotal)	38	2,812	1,187	2,514		6,551	5,700	851	0	0
Texas NFs in Texas (subtotal)	0	980	1,908	1,256		4,144	3,443	701	0	0
Utah Ashley Dixie Fishlake Manti-LaSal Uinta Wasatch-Cache	2,472 1,896 0 0 0 916	0 7,676 672 20 0 229	0 0 0 1,361 0 0	0 0 0 200 0 0		2,472 9,572 672 1,581 0 1,145	0 680 647 0 0 41	2,472 8,892 25 1,581 0 1,104	0 0 0 0 0 0	0 0 0 0 0 0
Subtotal	5,284	8,597	1,361	200		15,442	1,368	14,074	0	0

See footnotes at end of table.

Table 19—Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement					Total	Release subtotal	Thinning subtotal	Ferti- zation subtotal	Pruning subtotal
	Cubic foot productivity classes 2/ Acres									
	0-49	50-84	85-119	120+						
Vermont										
Green Mountain (subtotal)	982	1,668	263	3	2,916	1,557	1,359	0	0	0
Virginia										
George Washington	0	45	60	632	737	697	40	0	0	0
Jefferson	25	1,246	361	548	2,180	651	1,409	0	0	120
Subtotal	25	1,291	421	1,180	2,917	1,348	1,449	0	0	120
Washington										
Colville	546	2,800	3,374	0	6,720	1,762	4,958	0	0	0
Gifford Pinchot	0	14,236	7,820	5,315	27,371	497	24,360	2,432	82	82
Idaho Panhandle	130	0	509	322	961	219	742	0	0	0
Mt. Baker-Snoqualmie	0	120	2,558	2,999	5,677	248	4,572	807	50	50
Okanogan	1,404	3,154	769	0	5,327	2,149	2,978	200	0	0
Olympic	59	751	4,997	753	6,560	376	3,684	2,000	500	500
Umatilla	1,862	1,606	11	0	3,479	1	3,432	46	0	0
Wenatchee	0	20,019	5,038	0	25,057	4,864	11,440	6,961	1,792	1,792
Subtotal	4,001	42,686	25,076	9,389	81,152	10,116	56,166	12,446	2,424	2,424
West Virginia										
George Washington	0	0	0	700	700	700	0	0	0	0
Monongahela	4	116	801	166	1,087	254	833	0	0	0
Subtotal	4	116	801	866	1,787	954	833	0	0	0

See footnotes at end of table.

Table 19—Timber stand improvement needs as of October 1, 1990, by State, forest, and cubic foot productivity class--Continued

State, Commonwealth, or Territory 1/ National Forest	All timber stand improvement				Total	Release subtotal	Thinning subtotal	Fertili- zation subtotal	Pruning subtotal
	Cubic foot productivity classes 2/								
	0-49	50-84	85-119	120+					
	Acres								
Wisconsin									
Chequamegon	119	626	155	0	900	880	20	0	0
Nicolet	149	978	297	32	1,456	756	120	0	580
Subtotal	268	1,604	452	32	2,356	1,636	140	0	580
Wyoming									
Bighorn	11,836	314	0	0	12,150	1,603	10,547	0	0
Black Hills	904	0	0	0	904	0	904	0	0
Bridger-Teton	130	322	927	0	1,379	0	1,379	0	0
Medicine Bow	13,639	270	0	0	13,909	250	13,659	0	0
Shoshone	298	0	0	0	298	298	0	0	0
Subtotal	26,807	906	927	0	28,640	2,151	26,489	0	0
Total	186,104	368,570	330,094	328,885	1,213,653	438,851	669,821	89,684	15,297

1/ States not listed had no timber stand improvement needs as of October 1, 1990.

2/ Cubic foot productivity class refers to the cubic feet of wood produced per acre per year in a natural unmanaged stand.

Report of the Forest Service

Table 20—Timber offered, sold, unsold and harvested--fiscal years 1986-90

	1990	1989	1988	1987	1986
Offered					
Volume (billion board feet)	11.1	10.5	11.3	11.5	11.7
Sold					
Number of sales 1/	262,781	275,895	251,557	289,043	349,977
Volume (billion board feet)	9.3	8.4 2/	11.0	11.3	11.0
Value (million dollars) 3/	1,609.9	1,077.5	1,254.4	1,003.4	757.0
Not sold 4/					
Volume (billion board feet)	1.8	2.1	0.3	0.2	0.7
Harvested					
Volume (billion board feet)	10.5	12.0	12.6	12.7	11.8
Value (million dollars) 5/	1,187.6	1,309.7	1,235.7	1,016.0	786.9

1/ This is the number of sales that can be converted to board feet. Not included are 253,981 sales of nonconvertible product in FY 1990. (See table 23 for number of nonconvertible product sales per year.)

2/ Due to appeals and litigation, Spotted Owl Temporary Restraining Order delayed the offer and award of 1.6 billion board feet of new sales in Region 6 and .2 billion board feet in Region 5.

3/ This is the high bid value from all sales sold and includes stumpage, cost of reforestation, stand improvement costs, and timber salvage. Does not include value of roads or brush disposal.

4/ Difference between total volume offered and sold.

5/ This is the current stumpage rate for the actual volume harvested and includes the reforestation and stand improvement costs and timber salvage. Does not include value of roads or brush disposal.

Table 21--Timber offered, sold, unsold, and harvested by Region--fiscal years 1989-90

	1990				1989				
	Offered 1/	Sold 2/	Unsold 3/	Harvested 4/	Offered 1/	Sold 2/	Unsold 3/	Harvested 4/	
	Million board feet								
Northern	785.7	694.3	76.3	1,015.5	913.8	922.6	(8.8)	1,024.3	
Rocky Mountain	369.7	367.9	68.6	380.9	378.7	356.0	5/	422.1	
Southwestern	328.8	305.0	23.8	433.3	401.8	357.3	44.5	511.0	
Intermountain	406.0	415.0	(9.0)	415.8	358.3	388.4	(30.1)	419.7	
Pacific Southwest	1,644.2	1,501.1	143.1	1,712.2	1,713.2	1,498.9	214.3	1,984.7	
Pacific Northwest	5,047.9	3,997.1	1,050.8	3,878.4	4,413.2	2,811.3	1,601.9	5,230.8	
Southern	1,363.0	1,207.8	155.2	1,422.2	1,205.0	1,169.4	35.6	1,127.5	
Eastern	775.0	732.0	43.0	752.0	809.2	810.2	-1.0	784.7	
Alaska	338.3	29.6	308.7	471.7	321.6	100.4	221.2	6/	446.1
Total 7/	11,058.6	9,249.8	1,869.5	10,482.0	10,514.8	8,414.5	2,100.3	11,950.9	

1/ Sales offered for the first time.

2/ Does not include the volume of long-term sales released for harvesting. Includes miscellaneous small sales that were previously offered and/or sold and were reoffered and sold in the fiscal year being displayed.

3/ These were the timber sales that were offered but withdrawn (231.3 MMBF); offered but not opened until after 9/30/90 (111.7 MMBF); and no bid sales (358.1 MMBF). In addition, there were 1107.6 MMBF of timber sales that were offered, but not awarded, pending the certification of purchaser qualifications. Over 1,020 MMBF of this volume was in Region 6.

4/ Includes the volume harvested on long-term sales.

5/ Corrected figure; reported wrong in 1988 for Rocky Mountain.

6/ Includes long-term sales volume prepared in the offered column.

7/ Columns may not add due to rounding.

Report of the Forest Service

Table 22--Timber sold and harvested by State--fiscal year 1990 1/

State or Commonwealth 3/	Timber sold			Timber harvested 2/	
	Sales	Volume	Value 4/	Volume	Value 4/
		MBF 5/	Actual dollars	MBF 5/	Actual dollars
Alabama	875	72,000	4,504,242	74,942	5,067,595
Alaska	138	29,603	3,578,280	471,634	16,133,882 6/
Arizona	17,802	235,269	17,500,671	306,346	17,717,045
Arkansas	2,652	138,416	12,388,103	189,033	16,041,737
California	53,617	1,513,551	215,936,525	1,712,161	218,742,540
Colorado	27,758	168,620	4,932,955	185,782	2,941,288
Florida	167	65,704	4,801,376	86,559	6,328,971
Georgia	1,420	46,384	2,882,192	53,650	3,128,878
Idaho	27,067	724,171	63,881,926	837,089	46,494,843
Illinois	7	3,003	40,129	8,695	245,846
Indiana	19	67	1,202	56	616
Kentucky	1,114	36,838	1,369,306	29,705	1,167,038
Louisiana	734	96,587	7,684,153	155,977	11,710,951
Maine	5	94	5,881	851	44,198
Michigan	610	212,461	6,102,529	222,110	5,009,698
Minnesota	273	181,104	4,904,875	172,152	2,438,185
Mississippi	551	165,558	15,579,090	229,189	21,594,266
Missouri	1,798	48,587	3,108,642	58,294	2,982,984
Montana	13,118	304,366	36,349,659	495,855	35,827,530
Nebraska	25	1,214	30,360	701	9,943
Nevada	2,605	3,341	32,225	5,407	30,267
New Hampshire	89	27,220	1,004,312	33,415	1,058,083
New Mexico	15,251	69,708	1,975,570	126,916	2,944,186
New York	16	399	4,786	363	20,999
North Carolina	1,155	47,635	1,184,509	71,094	1,463,306
North Dakota	87	119	1,190	98	1,050
Ohio	165	5,666	323,513	6,073	443,255
Oklahoma	118	12,275	661,298	25,109	1,653,806
Oregon	43,871	2,786,180	882,666,526	2,993,319	574,955,559
Pennsylvania	177	72,098	12,769,261	79,079	14,108,801
South Carolina	769	378,179	14,973,460	318,551	13,169,076
South Dakota	2,672	144,643	10,424,382	132,462	5,769,975
Tennessee	730	24,958	951,649	30,459	1,402,530
Texas	1,562	77,457	8,217,234	95,471	7,938,605
Utah	13,351	62,103	3,241,094	78,971	2,104,105
Vermont	30	7,378	276,348	8,432	322,667
Virginia	3,487	42,828	1,114,911	62,507	935,226
Washington	13,597	1,202,835	254,503,265	885,093	138,572,695
West Virginia	348	38,059	3,318,377	28,300	2,197,138
Wisconsin	109	138,828	3,437,254	134,190	2,309,765
Wyoming	12,842	64,189	3,262,277	75,901	2,588,401
Total 7/	262,781	9,249,695	1,609,925,537	10,481,991	1,187,617,529

1/ Excludes nonconvertible products such as Christmas trees, cones, burls, etc.

2/ Preliminary.

3/ States not listed had no timber sold or harvested in fiscal year 1990.

4/ Includes Knutson-Vandenberg and salvage sale receipts. Does not include brush disposal and road costs.

5/ MBF = thousand board feet.

6/ The timber sale harvest values for Alaska include repayments as a result of rate redetermination for short-term sales due to the Federal Timber Contract Payment Modification Act of 1984.

7/ Columns may not add due to rounding.

Table 23—Number of sales, volume, and value of timber sold on National Forest lands by size class--fiscal years 1986-90

		Sale size class						Noncon- vertibles 2/	Total less non- convertibles 3/
		To 300	301- 2,000	2,001- 2,000 MBF 1/	2,001- 5,000 MBF	5,001- 15,000 MBF	15,001 MBF and over		
1986									
	Number of sales	325,646	20,320	2,763	587	606	55	205,132	349,977
	Volume (MBF)	851,974	363,324	1,517,092	1,922,224	5,269,466	1,042,497	0	10,966,577
	Value (\$1,000)	7,359.1	8,533.7	76,133.3	116,679.4	466,693.2	81,624.3	1,671.4	757,023.0
1987									
	Number of sales	273,210	11,795	2,684	641	662	51	224,751	289,043
	Volume (MBF)	672,064	245,148	1,533,199	2,087,251	5,833,972	947,353	0	11,318,987
	Value (\$1,000)	4,615.2	4,550.9	96,869.4	163,158.6	633,067.2	101,128.6	1,885.9	1,003,389.9
1988									
	Number of sales	233,567	13,791	2,806	701	652	40	249,784	251,557
	Volume (MBF)	550,589	242,616	1,514,723	2,304,845	5,562,653	792,807	0	10,968,233
	Value (\$1,000)	3,944.0	4,691.7	114,447.7	252,343.8	791,130.5	87,829.9	2,401.5	1,254,387.6
1989									
	Number of sales	253,542	18,392	2,849	615	462	35	250,081	275,895
	Volume (MBF)	555,149	276,650	1,612,985	1,947,180	3,510,835	511,786	0	8,414,585
	Value (\$1,000)	4,244	6,830	130,713	225,523	629,542	80,683	2,864	1,077,534
1990									
	Number of sales	247,078	11,258	3,274	645	503	23	253,981	262,781
	Volume (MBF)	491,767	239,889	1,799,519	2,154,272	4,137,737	426,510	0	9,249,695
	Value (\$1,000)	4,190	6,841	179,729	361,163	980,264	77,737	2,882	1,609,925

1/ MBF = thousand board feet.

2/ Nonconvertible products include Christmas trees, cones, burls, etc.

3/ May not add due to rounding.

Report of the Forest Service

Table 24—Uncut timber volume under contract by Region--fiscal years 1986-90

Region	1990	1989	1988	1987	1986
<i>Million board feet 1/</i>					
Northern	1,839	2,210	2,382	2,618	3,274
Rocky Mountain	908	912	1,036	1,154	1,208
Southwestern	434	606	768	936	1,088
Intermountain	639	612	620	772	848
Pacific Southwest	2,240	2,650	3,275	3,943	4,456
Pacific Northwest	8,029	7,112	9,959	11,241	10,308
Southern	1,354	1,673	1,543	1,948	2,186
Eastern	1,712	1,732	1,778	1,820	2,054
Alaska	269	377	417	438 2/	562
Total	17,424	17,884	21,778	24,870	25,984

1/ Volume in local scale. Long-term sales not included. Long-term sales volume under contract at the end of fiscal year 1990 was 5,293 million board feet and 5,566 million board feet in 1989.

2/ Corrected figure; reported wrong in 1987 report.

3/ This volume under contract has been reduced by 9,748 million board feet as a result of the Federal Timber Contract Payment Modification Act of 1984.

Tables: National Forest System

Table 25—Timber sale funding--fiscal years 1988-90 1/

	1990	1989	1988
	<i>1,000 dollars</i>		
National Forest System			
Timber management	185,561	149,782	141,228
Harvest administration	66,235	57,556	44,333
Excess timber receipts	-	29,252	-
Subtotal	251,796	236,590	185,561
Support to timber sales program			
Minerals	1,389	1,396	1,077
Forest fire protection	4,063	4,564	3,843
Recreation	12,406	10,358	7,992
Wildlife and fish	9,700	9,470	8,613
Range	989	881	988
Soil and water	9,057	8,619	8,103
Landline location	18,355	19,851	20,979
Subtotal	55,959	55,139	51,595
Road construction			
Forest Service construction	93,030	120,028	128,257
Purchaser construction	(120,310)	(81,193)	(103,781)
Purchaser construction by the Forest Service	2,946	2,762	4,330
Subtotal	95,976	122,790	132,587
Total, appropriated accounts	403,731	414,519	369,743
Special accounts 2/			
Timber salvage sales	111,006	47,561	61,502
Tongass timber supply fund 3/	36,955	35,034	34,073
Subtotal	147,961	82,595	95,575
Total	551,692	497,114	465,318

1/ Timber sale preparation and offer costs displayed are the actual appropriated funds for FY 1988-90. Costs displayed in TSPIRS tables 26-28 are the accrued costs for the FY 1990 timber program.

2/ Includes General Administration expenses.

3/ Does not include reforestation/timber stand improvement.

Report of the Forest Service

Table 26—Statement of timber sale revenues and expenses--fiscal year 1990 1/

Account activity	Totals 2/
	<i>1,000 constant 1990 dollars</i>
Revenues	
Timber sales	1,609,925
Purchaser road credits established	109,881
Associated charges	76,533
Interest and penalties	1,869
Total revenues	1,798,208
Controllable expenses	
Sale administration expenses	75,798
Sale activity pool allowance	438,684
Growth activity pool allowance	87,536
Facility depreciation	1,769
Timber program General Administration	141,963
Total operating expenses	745,750
Gain/loss before payment to states	1,052,458
Payment to states	327,264
Net gain/loss from timber sales	725,194
Volume harvested (BBF)	10,482

1/ Source data from Statement of Revenues and Expenses of Timber Sale Program Information Reporting System (TSPIRS). TSPIRS is an accounting report which allocates capital expenditures, such as costs for roads, facilities, and investments in roads, differently from that in cash flow reports for capital investments and operating costs as represented in table 25. For this reason, the various cost and expenditure data in the two tables are not directly comparable.

2/ These are national totals for 1990. The Timber Sale Program Annual Report, with Forest and State level information, will be available in February.

Tables: National Forest System

Table 27—Employment , income, and program level account--fiscal year 1990 1/

	Units	Totals
		<i>1,000 constant 1990 dollars</i>
Employment and income		
Total employment (jobs)	Jobs	105,583
Total income (M\$)	\$ Amount	3,257,263
Federal income taxes generated (M\$)	\$ Amount	494,065
Related timber information		
Timber		
Offered	MMBF 2/	11,127
Sold	MMBF	9,569
Harvested		
Sawtimber	MMBF	8,136
Roundwood	MMBF	1,322
Other	MMBF	1,024
Total harvested		<u>10,482</u> 3/
Total acres harvested	Acres	<u>1,027,435</u>
Fuelwood		
Free use	MMBF	<u>160</u>
Nonconvertible products		
Christmas trees sold	Trees	468,059
Other (M\$)	\$ Amount	<u>1,216</u>
Regeneration acres treated	Acres	480,247
Timber stand improvement rtreatments	Acres	<u>382,931</u>
Forest road program (in support of the timber program) 4/		
Appropriated		
Construction	Miles	136
Reconstruction	Miles	<u>721</u>
Subtotal	Miles	857
Purchaser credits and elect funds		
Construction	Miles	1,830
Reconstruction	Miles	<u>3,832</u>
Subtotal	Miles	5,662
Total roads	Miles	6,519

1/ These are national totals for 1990. The Timber Sale Program Annual Report, with Forest and State level information, will be available in February.

2/ MMBF = million board feet.

3/ Does not agree with FY 1992 Explanatory Notes due to more current information being available.

4/ Includes Tongass Timber Supply Fund miles.

Report of the Forest Service

Table 28—The economic account--fiscal year 1990 1/

	Totals
	<i>1,000 constant 1990 dollars</i>
Present value of benefits	
Positive effects	
Timber	1,822,909
Recreation	4,034
Wildlife	36,200
Fisheries	2,990
Grazing	3,513
Soils	961
Water	110,798
Total	1,981,405
Negative effects	
Timber	0
Recreation	934
Wildlife	8,518
Fisheries	1,027
Grazing	2
Soils	627
Water	7
Total	11,115
Total present benefits (positive less negative)	1,970,290
Present value of costs	
Timber	618,295
Roads	212,824
Recreation	810
Wildlife	9,900
Fisheries	1,463
Grazing	1,005
Soils	297
Water	796
Total	845,390
Present net value	1,124,900

1/ These are national totals for 1990. The Timber Sale Program Annual Report, with Forest and State level information, will be available in February.

Table 29—Activities accomplished with excess timber receipts--fiscal year 1990

Activity	Units	Outputs	Funded
Timber sale administration & management		350 1/	11,110,000
Reforestation	Acres	1,826	3,703,000 2/
Timber stand improvement	Acres	3,877	-
Wildlife habitat	Acres Structures	21,279 616	7,407,000 3/
Fish habitat improvement	Acres Structures	2,203 745	-
Threatened & endangered species	Acres Structures	5,402 336	-
Soil and water improvement	Acres	8,809	7,407,000
Cultural resource management		- 1/	1,852,000
Wilderness management		- 1/	1,852,000
Forest trail maintenance	Miles	- 1/	2,222,000
Forest trail construction	Miles	153	1,481,000
Total resource management			37,034,000

1/ No targets were assigned to these activities.

2/ Includes funding for reforestation and timber stand improvement.

3/ Includes funding for wildlife, fish, and threatened and endangered species.

Report of the Forest Service

Table 30--Range allotment management status by Region--fiscal year 1990

Region	Number of allotments			Acres	
	Total	With approved plans	With plans implemented	Total	Suitable 1/
Northern	1,692	1,481	1,367	11,152,259	4,083,055
Rocky Mountain	2,484	1,928	1,828	18,810,916	8,375,255
Southwestern	1,409	1,264	1,140	21,878,612	13,193,712
Intermountain	1,894	1,630	1,559	26,817,298	11,378,698
Pacific Southwest	812	637	609	11,679,823	4,649,063
Pacific Northwest	762	545	486	11,743,603	7,219,517
Southern	578	343	319	1,707,679	1,225,926
Eastern	203	172	159	95,645	47,129
Total	9,834	8,000	7,467	103,885,835 2/	50,172,355 2/

1/ Suitable acres are acres accessible to livestock and which can be grazed on a sustained yield basis without damage to the resource.

2/ FY 1989 data.

Table 31--Range allotment management status--fiscal years 1986-90

	Unit of measure	1990	1989	1988	1987	1986
Total allotments 1/	Allotments	9,834	9,752	9,868	9,610	9,658
With approved plans	Allotments	8,000	8,050	8,077	8,090	8,124
With plans implemented	Allotments	7,467	7,050	7,473	7,335	7,503
Total acres	MM acres	104	104	104	100	103
Suitable acres	MM acres	50	50	50	50	50
Permitted use 2/	MM AUM's	9.6	9.6	9.9	9.9	10.1
Actual use	MM AUM's	8.1	7.8	8.4	8.4	8.7

1/ Does not include vacant allotments.

2/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow or the equivalent for 1 month.

Tables: National Forest System

Table 32--Actual grazing use in AUM's by State--fiscal year 1990 1/

State, Commonwealth, or Territory 2/	Cattle	Sheep	Domestic horses	Wild horses 3/	Wild burros 3/	Total
Alabama	3,107	0	48	0	0	3,155
Arizona	1,200,132	16,450	9,143	0	0	1,225,725
Arkansas	25,270	0	51	0	0	25,321
California	709,760	47,669	17,645	(6,343)	(612)	775,074
Colorado	785,240	148,089	13,165	0	(14)	946,494
Florida	49,628	0	0	0	0	49,628
Georgia	11,945	0	0	0	0	11,945
Idaho	487,351	124,101	17,727	0	0	629,179
Illinois	16,584	3,472	72	0	0	20,128
Kansas	33,353	0	0	0	0	33,353
Kentucky	250	0	0	0	0	250
Louisiana	21,516	0	0	0	0	21,516
Maryland	1,319	0	0	0	0	1,319
Minnesota	94	0	0	0	0	94
Mississippi	4,930	0	0	0	0	4,930
Missouri	26,260	0	0	0	0	26,260
Montana	513,913	19,297	22,571	0	0	555,781
Nebraska	116,513	0	10	0	0	116,523
Nevada	187,597	39,073	6,349	(4,579)	0	233,019
New Mexico	695,476	21,794	10,602	(924)	0	727,872
New York	7,601	0	98	0	0	7,699
North Dakota	373,217	91	2,026	0	0	375,334
Ohio	890	0	7	0	0	897
Oklahoma	22,859	912	18	0	0	23,789
Oregon	437,465	33,790	5,665	(3,024)	0	476,920
South Dakota	409,719	5,493	276	0	0	415,488
Texas	48,657	0	47	0	0	48,704
Utah	440,797	193,153	1,827	(1)	0	635,777
Vermont	232	0	0	0	0	232
Virginia	2,536	0	0	0	0	2,536
Washington	94,620	11,967	3,300	0	0	109,887
West Virginia	8,451	141	55	0	0	8,647
Wyoming	487,082	113,420	9,074	0	0	609,576
Total	7,224,364	778,912	119,776	(14,871)	(626)	8,123,052

1/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.

2/ States not listed had no Forest Service grazing program in 1990.

3/ Wild horses and wild burros totals are included in totals for domestic horses.

Table 33--Annual grazing statistics--fiscal year 1990

	Permittees		Cattle		Horses and burros		Sheep and goats		Total
	Number	AUM's 1/	Number	AUM's	Number	AUM's	Number	AUM's	
Permitted to graze	1,370,963	8,476,812	92,558	98,590	1,203,977	1,003,211	2,667,498	9,578,613	
Actually grazed: Paid permits	10,527	7,197,499	13,000	46,109	956,905	774,245	2,376,504	8,017,853	
Free use:									
Recreation stock	24,115 2/	109	86,451	46,366			86,521	46,475	
Other free use	133	17,142	1,219	11,666	1,203	3,596	4,465	32,404	
Private land permits 3/	(435)	(359,050)	(492)	(5,342)	(13,989)	(12,962)	(70,168)	(377,354)	
Crossing	26	2,159	157	9	13,927	1,001	26,741	3,169	
Unauthorized use	29	7,455	53	129	150	70	2,299	7,654	
Total 3/	34,830	7,224,364	100,880	104,279	972,185	778,912	2,496,530	8,107,555	
Wild horses			2,410	14,871			2,410	14,871	
Wild burros			432	626			432	626	
Total actually grazed 3/	34,830	7,224,364	103,722	119,776	972,185	778,912	2,499,372	8,123,052	

1/ An animal unit month (AUM) is the amount of forage required by a 1,000-pound cow, or the equivalent for 1 month.

2/ Includes term and temporary grazing permits and all other paid permits (e.g., transportation, research, working animals, special uses, etc.).

3/ Private land permit data not included in totals.

Tables: National Forest System

Table 34--Range improvements by type--fiscal year 1990 1/

Improvement type	Units of measure	Units of construction completed	Total cost <i>Actual dollars</i>
Structural:			
Water developments	Sites		
Range fence	Miles		
Pipeline	Miles		
Other structural facilities	Sites		
Subtotal			
Nonstructural:			
Cover manipulation, brush	Acres		
Range plant control	Acres		
Forage improvement	Acres		
Noxious farm weed control	Acres		
Subtotal			
Total			

1/ Table 34 is being deleted because the Range Management Information System, used for this table, is not compatible with the reporting system used in the Explanatory Notes.

Report of the Forest Service

Table 35—Total recreation use on National Forest System lands by State--fiscal years 1986-90

State, Commonwealth, or Territory 1/	1990	1989	1988	1987	1986
	<i>1,000 RVD's 2/</i>				
Alabama	698.1	685.5	741.4	850.4	771.0
Alaska	5,413.6	4,636.2	4,354.5	4,085.3	3,584.6
Arizona	19,038.5	18,997.5	18,831.2	18,839.8	17,451.6
Arkansas	2,440.9	2,377.0	2,358.5	2,278.7	2,213.7
California	61,006.6	63,685.3	59,516.9	57,975.4	55,745.9
Colorado	25,204.2	23,238.2	21,484.0	22,583.3	20,158.7
Florida	2,961.2	2,851.5	2,787.5	2,731.5	2,637.2
Georgia	2,833.3	2,715.1	2,707.0	2,669.4	2,314.5
Idaho	11,819.1	11,738.3	10,736.3	10,806.5	10,342.1
Illinois	1,637.7	950.1	891.5	830.0	972.6
Indiana	568.8	587.6	430.1	483.2	425.1
Kansas	61.3	48.0	38.2	21.8	21.0
Kentucky	2,446.5	2,327.0	2,301.3	2,248.7	2,162.9
Louisiana	527.3	512.7	502.3	418.1	475.7
Maine	57.7	52.8	47.6	47.6	46.1
Michigan	4,916.4	4,725.4	4,319.6	4,409.8	4,196.7
Minnesota	5,399.3	5,147.6	4,449.6	4,382.3	4,297.5
Mississippi	1,177.1	1,236.9	1,240.4	1,179.5	1,128.3
Missouri	1,712.6	1,704.8	1,705.0	1,716.4	1,693.6
Montana	9,703.6	9,412.5	8,843.7	9,912.3	8,899.8
Nebraska	148.7	142.0	181.1	163.0	106.8
Nevada	3,277.9	3,081.5	2,656.8	2,353.8	2,148.6
New Hampshire	2,675.6	2,683.7	2,783.0	2,474.1	2,259.5
New Mexico	7,704.2	7,465.6	7,227.5	6,446.6	6,015.5
New York	71.5	22.4	25.6	22.8	23.2
North Carolina	5,472.0	5,036.2	4,973.2	4,572.1	4,258.1
North Dakota	168.5	184.3	186.7	131.3	142.0
Ohio	504.4	429.5	410.7	411.7	381.0
Oklahoma	386.8	341.4	331.4	320.6	357.0
Oregon	21,035.7	18,231.1	19,598.1	19,210.1	19,294.9
Pennsylvania	2,631.2	2,605.1	2,621.4	2,394.1	2,067.6
Puerto Rico	185.6	396.0	399.7	382.2	539.1
South Carolina	816.1	974.5	916.5	920.0	845.1
South Dakota	2,965.5	2,737.3	2,734.9	2,687.4	2,692.4
Tennessee	2,826.0	2,655.3	2,561.7	2,432.2	2,170.4
Texas	2,154.8	2,057.1	1,863.6	1,923.9	1,958.7
Utah	12,744.1	13,312.8	14,454.8	13,736.9	13,179.4
Vermont	1,368.9	1,352.3	1,154.1	1,029.1	11,142.9
Virginia	3,900.1	3,946.3	3,804.0	3,726.4	3,498.7
Washington	22,451.1	18,017.7	15,477.6	15,058.3	14,863.9
West Virginia	1,234.4	1,146.3	1,152.1	1,137.2	1,265.6
Wisconsin	2,094.9	1,978.6	2,000.1	1,952.5	1,909.8
Wyoming	6,608.8	6,068.0	6,514.5	6,502.0	5,873.9
Total	263,050.6	252,495.0	242,315.7	238,458.3	236,532.7

1/ States not listed have no Forest Service recreation program.

2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.



Report of the Forest Service

Table 36—State summary of total recreation use on National Forest System lands by activity—fiscal year 1990

State, Commonwealth, or Territory 1/	Camping, picnicking & swimming	Mechanized travel & viewing scenery	Hiking, horseback riding & water travel	Winter sports	Resorts, cabins & organization camps
<i>1,000 RVD's 2/</i>					
Alabama	231.2	106.1	59.2	0.0	0.4
Alaska	310.2	3,295.5	366.7	124.3	146.0
Arizona	5,761.7	8,257.6	1,513.9	222.5	848.2
Arkansas	677.8	570.0	201.0	0.1	18.7
California	16,424.5	22,226.4	3,831.2	3,833.5	6,489.8
Colorado	5,649.4	8,123.3	1,971.0	5,431.2	591.9
Florida	1,617.2	436.7	170.3	0.0	212.1
Georgia	836.2	881.2	328.8	2.0	43.2
Idaho	3,468.4	3,331.5	1,040.9	588.0	616.8
Illinois	395.2	616.1	266.5	0.8	7.1
Indiana	224.5	58.2	59.1	0.0	0.0
Kansas	15.0	23.6	1.9	0.0	0.1
Kentucky	660.5	788.0	333.9	1.6	19.9
Louisiana	177.2	130.8	10.7	0.0	32.2
Maine	18.3	8.6	11.5	1.2	2.4
Michigan	1,323.8	1,792.3	250.0	59.4	134.9
Minnesota	1,955.5	978.8	540.2	136.5	521.0
Mississippi	229.9	299.3	112.4	0.0	7.4
Missouri	502.7	498.6	221.7	0.0	10.7
Montana	1,929.8	2,913.2	1,303.8	616.2	336.1
Nebraska	44.5	29.3	11.5	0.2	30.0
Nevada	984.0	945.7	376.3	285.0	137.1
New Hampshire	662.2	798.1	464.6	567.0	86.0
New Mexico	2,640.6	1,739.5	746.0	619.2	220.5
New York	58.1	1.7	3.6	1.3	0.0
North Carolina	1,432.1	1,837.4	778.4	8.4	78.2
North Dakota	24.0	68.2	12.4	1.3	0.6
Ohio	146.7	109.9	67.6	1.1	0.0
Oklahoma	64.4	176.9	30.1	0.2	0.3
Oregon	6,758.0	7,954.3	1,676.8	649.1	1,409.2
Pennsylvania	807.0	1,067.3	230.4	9.6	84.8
Puerto Rico	73.9	60.2	17.7	0.0	7.2
South Carolina	211.4	208.8	130.8	0.0	2.4
South Dakota	205.1	2,217.9	112.9	17.2	116.1
Tennessee	1,114.7	806.5	297.6	5.2	102.2
Texas	569.2	370.1	83.4	0.0	17.6
Utah	4,691.1	3,169.6	980.0	950.4	731.1
Vermont	109.5	205.0	62.4	799.9	40.2
Virginia	1,014.0	1,136.9	394.1	12.7	20.2
Washington	7,535.1	8,362.6	2,295.4	777.7	1,320.9
West Virginia	460.7	193.1	113.2	2.7	22.0
Wisconsin	531.7	700.5	90.5	26.7	21.0
Wyoming	1,597.6	1,700.9	972.8	391.3	619.3
Total	74,144.6	89,196.2	22,543.2	16,143.5	15,105.8

See footnotes at end of table.

Tables: National Forest System

Table 36—State summary of total recreation use on National Forest System lands by activity—fiscal year 1990--
Continued

Hunting	Fishing	Nature studies <i>1,000 RVD's 2/</i>	Other recreation activities	Total	State, Commonwealth, or Territory 1/
162.7	69.9	7.9	60.7	698.1	Alabama
128.2	419.4	29.1	594.2	5,413.6	Alaska
714.1	653.4	122.8	944.3	19,038.5	Arizona
521.5	301.2	23.2	127.4	2,440.9	Arkansas
1,382.6	3,013.5	397.4	3,407.7	61,006.6	California
1,336.5	1,343.6	105.7	651.6	25,204.2	Colorado
232.6	165.5	21.0	105.8	2,961.2	Florida
389.7	228.0	35.8	88.4	2,833.3	Georgia
936.9	946.9	94.5	795.2	11,819.1	Idaho
212.2	78.3	21.3	40.2	1,637.7	Illinois
110.1	100.0	3.1	13.8	568.8	Indiana
8.2	4.2	2.7	5.6	61.3	Kansas
200.8	288.0	30.0	123.8	2,446.5	Kentucky
102.6	31.3	2.0	40.5	527.3	Louisiana
8.5	4.2	1.4	1.6	57.7	Maine
606.2	526.1	24.6	199.1	4,916.4	Michigan
340.8	736.8	21.9	167.8	5,399.3	Minnesota
363.2	70.7	21.0	73.2	1,177.1	Mississippi
261.3	106.1	17.9	93.6	1,712.6	Missouri
969.6	743.7	112.1	779.1	9,703.6	Montana
12.4	1.5	1.0	18.3	148.7	Nebraska
210.1	99.0	68.1	172.6	3,277.9	Nevada
34.4	26.7	12.3	24.3	2,675.6	New Hampshire
578.2	344.5	141.9	673.8	7,704.2	New Mexico
4.2	1.4	0.3	0.9	71.5	New York
767.3	300.2	68.4	201.6	5,472.0	North Carolina
49.7	2.6	3.1	6.6	168.5	North Dakota
124.9	22.5	3.5	28.2	504.4	Ohio
66.6	26.8	3.0	18.5	386.8	Oklahoma
739.7	1,050.4	188.9	609.3	21,035.7	Oregon
199.0	152.5	18.5	62.1	2,631.2	Pennsylvania
0.0	0.0	0.9	25.7	185.6	Puerto Rico
156.3	43.3	6.2	56.9	816.1	South Carolina
116.3	57.0	14.8	108.2	2,965.5	South Dakota
231.0	184.9	25.9	58.0	2,826.0	Tennessee
251.3	808.0	13.1	42.1	2,154.8	Texas
861.0	759.0	100.5	501.4	12,744.1	Utah
61.9	16.5	30.1	43.4	1,368.9	Vermont
774.7	318.3	47.5	181.7	3,900.1	Virginia
651.4	596.7	211.9	699.4	22,451.1	Washington
225.7	141.8	6.2	69.0	1,234.4	West Virginia
237.6	391.9	5.0	90.0	2,094.9	Wisconsin
570.6	439.5	48.2	268.6	6,608.8	Wyoming
15,912.6	15,615.8	2,114.7	12,274.2	263,050.6	Total

1/ States not listed have no Forest Service recreation program.

2/ One recreation visitor-day (RVD) is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table 37--Trail miles on the National Forest System by State--fiscal years 1988-90 1/

State, Commonwealth, or Territory 2/	1990			1989			1988		
	Total	Constructed	3/ Maintained	Total	Constructed	3/ Maintained	Total	Constructed	3/ Maintained
Alabama	207	8	164	216	14	185	244	8	138
Alaska	879	10	469	804	36	428	948	12	354
Arizona	3,989	117	545	3,745	131	563	3,899	44	360
Arkansas	558	34	365	465	14	465	518	15	332
California	13,303	241	5,977	13,295	192	8,121	12,443	189	5,204
Colorado	8,655	225	5,263	7,801	388	4,784	8,734	221	2,784
Florida	345	9	345	350	1	204	269	2	180
Georgia	627	4	498	500	11	496	535	8	458
Idaho	17,990	118	8,704	14,119	149	5,956	16,931	152	7,508
Illinois	339	14	73	187	0	47	206	0	206
Indiana	140	10	140	160	4	160	120	0	80
Kansas	36	0	14	31	0	9	0	0	0
Kentucky	487	10	487	505	8	276	544	4	266
Louisiana	138	0	138	128	10	122	127	0	69
Maine	171	1	171	171	0	0	116	4	116
Michigan	2,428	90	1,940	2,254	88	2,199	2,461	93	1,713
Minnesota	2,587	53	2,587	2,740	33	2,740	2,698	45	2,645
Mississippi	276	9	196	238	21	238	396	4	127
Missouri	1,308	25	987	1,283	21	995	623	14	537
Montana	13,854	127	7,714	15,456	132	9,585	12,820	93	4,676
Nebraska	50	0	50	58	0	0	52	2	1
Nevada	1,635	13	497	1,901	20	676	1,647	1	481
New Hampshire	1,308	3	1,047	1,258	10	0	1,283	47	1,083
New Mexico	4,270	19	1,298	3,832	31	714	3,654	28	1,596
New York	31	1	31	29	1	25	32	7	32
North Carolina	1,457	11	713	1,457	16	713	1,408	26	810
North Dakota	34	3	4	29	29	26	0	0	0
Ohio	240	49	240	185	19	185	134	35	75
Oklahoma	175	0	92	167	0	78	82	0	30
Oregon	10,133	130	6,787	8,687	112	6,033	8,807	293	5,284
Pennsylvania	646	24	252	636	11	636	428	15	428
Puerto Rico	26	2	17	20	1	20	21	1	21
South Carolina	258	27	258	381	7	266	533	15	212

See footnotes at end of table

Table 37--Trail miles on the National Forest System by State--fiscal years 1988-90--Continued

State, Commonwealth, or Territory 2/	1990			1989			1988		
	Total	Constructed	3/ Maintained	Total	Constructed	3/ Maintained	Total	Constructed	3/ Maintained
South Dakota	231	8	231	193	30	94	176	13	10
Tennessee	663	17	663	637	7	385	592	15	582
Texas	274	1	274	283	0	168	208	15	161
Utah	4,903	16	2,484	4,339	84	2,393	5,075	75	2,203
Vermont	965	4	200	965	13	200	670	23	670
Virginia	2,060	24	694	1,860	11	974	1,871	14	1,039
Washington	7,869	108	5,681	8,001	190	5,925	7,239	197	4,488
West Virginia	818	20	454	815	57	334	863	69	269
Wisconsin	1,670	21	1,261	1,963	12	1,114	1,348	7	1,056
Wyoming	6,334	31	3,102	6,237	30	2,585	6,079	28	2,121
Total 4/	114,367	1,637	63,104	461,360	1,944	397,596	280,265	1,834	222,178

1/ Includes work accomplished by Human Resource Programs and volunteers.

2/ States not listed have no Forest Service recreation program.

3/ Miles constructed include construction of new trails and reconstruction of existing trails. The predominant activity is reconstruction. Funds used are appropriated, other, and timber receipts.

4/ Totals may not add due to rounding.

Table 38--Additions to the National Wild and Scenic Rivers System--fiscal year 1990

River	State	Date	Miles
Pecos	New Mexico	6/6/90	20.5
East Fork Jemez	New Mexico	6/6/90	11.0
Total			31.5



Photo by Barry Nehr

Tables: National Forest System

Table 39—Acres of the National Wilderness Preservation System by State--calendar years 1986-90 1/

State, Commonwealth, or Territory 2/	1990	1989	1988	1987	1986
	<i>1,000 acres 3/</i>				
Alabama	33	33	33	19	19
Alaska	5,453	5,453	5,453	5,453	5,453
Arizona	1,345	1,345	1,338	1,316	1,316
Arkansas	116	115	115	115	116
California	3,902	3,921	3,921	3,922	3,920
Colorado	2,587	2,587	2,587	2,587	2,584
Florida	73	73	73	73	73
Georgia	89	89	89	89	89
Idaho	3,960	3,960	3,960	3,960	3,957
Indiana	13	13	13	13	13
Kentucky	16	17	17	17	18
Louisiana	9	9	9	9	9
Maine	12	0	0	0	0
Michigan	92	92	92	92	0
Minnesota	799	799	798	798	798
Mississippi	5	6	6	6	5
Missouri	63	63	63	63	63
Montana	3,372	3,372	3,372	3,372	3,371
Nebraska	8	8	8	8	8
Nevada	788	65	65	65	65
New Hampshire	103	103	103	103	103
New Mexico	1,388	1,388	1,388	1,388	1,391
North Carolina	102	101	101	101	101
Oklahoma	14	14	14	0	0
Oregon	2,080	2,079	2,078	2,078	2,078
Pennsylvania	9	9	9	9	10
South Carolina	17	17	17	17	17
South Dakota	10	10	10	10	10
Tennessee	66	67	67	67	67
Texas	35	36	36	36	35
Utah	774	774	775	775	780
Vermont	59	59	59	59	59
Virginia	87	89	90	65	65
Washington	2,571	2,571	2,571	2,571	2,573
West Virginia	81	81	81	78	78
Wisconsin	42	42	42	42	44
Wyoming	3,080	3,080	3,081	3,081	3,081
Total 4/	33,255	32,540	32,534	32,457	32,369

1/ Includes all changes to the Wilderness Preservation System through the 100th Congress.

2/ States not listed have no National Forest System acres in the National Wilderness Preservation System.

3/ Acreage for most states is estimated pending final map compilation; therefore, minor changes may occur between years.

4/ Total acreage is shown. The difference between the total and column sum is due to rounding.

Table 40—Additions to the National Wilderness Preservation System--fiscal year 1990

Public Law	State	Date	Number of new areas	Number of additions	Number of adjustments	Acres
P.L. 101-195	Nevada	12/5/89	13	1	0	733,400
P.L. 101-401	Maine	9/28/90	1	0	0	12,000
Total			14	1	0	745,400



Photo by Jim Hughes

Tables: National Forest System

Table 41--Wildlife and fish habitat inventory and improvement by Region--fiscal year 1990 1/

Region	Wildlife	Inland fish	Anadromous fish	Threatened, endangered & sensitive species	Total
Northern					
Acres of inventory	2,410	-	-	-	2,410
Acres of improvement	11,310	285	220	686	12,501
Structures	176	467	302	69	1,014
Rocky Mountain					
Acres of inventory	83,478	5,088	-	219,728	308,294
Acres of improvement	27,663	732	-	80	28,475
Structures	571	426	-	28	1,025
Southwestern					
Acres of inventory	1,299,941	1,105	-	1,516,150	2,817,196
Acres of improvement	14,994	245	-	4,785	20,024
Structures	251	3,399	-	79	3,729
Intermountain					
Acres of inventory	41,875	5	-	307,600	349,480
Acres of improvement	15,201	375	48	79	15,703
Structures	358	937	68	349	1,712
Pacific Southwest					
Acres of inventory	75,300	3,314	5,158	848,914	932,686
Acres of improvement	3,147	104	47	800	4,098
Structures	211	251	278	41	781
Pacific Northwest					
Acres of inventory	82,421	1,237	1,775	495,551	580,984
Acres of improvement	6,346	366	198	718	7,628
Structures	1,292	1,160	1,799	136	4,387
Southern					
Acres of inventory	-	-	-	-	0
Acres of improvement	28,793	2,476	-	23,888	55,157
Structures	1,285	1,084	-	391	2,760
Eastern					
Acres of inventory	159,731	2,910	629	108,417	271,687
Acres of improvement	18,783	3,536	422	2,658	25,399
Structures	2,721	1,809	1,284	575	6,389
Alaska					
Acres of inventory	252,630	710	140,000	3,670	397,010
Acres of improvement	6,822	-	1,100	-	7,922
Structures	63	7	58	80	208
Total Total					
Acres of inventory	1,997,786	14,369	147,562	3,500,030	5,659,747
Acres of improvement	133,059	8,119	2,035	33,694	176,907
Structures	6,928	9,540	3,789	1,748	22,005

1/ Does not include activities accomplished in support of other resource programs.

Report of the Forest Service

Table 42--Road and bridge construction and reconstruction by State--fiscal year 1990

State, Commonwealth, or Territory 2/	From Appropriated Funds 1/							
	Construction				Reconstruction			
	Roads		Bridges		Roads		Bridges	
	Miles	Cost	No.	Cost	Miles	Cost	No.	Cost
	1000 dollars		1000 dollars		1000 dollars		1000 dollars	
Alabama	0.0	47.1	0	0.0	6.6	741.4	2	53.1
Alaska	0.9 4/	873.5 4/	0	0.0	4.6 4/	571.9 4/	0	0.0
Arizona	2.8	521.6	1	18.6	29.3	4,674.5	0	4.3
Arkansas	0.0	518.2	0	1.1	12.6	1,869.2	1	137.4
California	7.4	9,064.3	0	25.2	95.8	12,418.7	4	396.9
Colorado	8.4	1,662.2	1	213.2	37.0	3,627.6	0	0.0
Florida	0.4	69.5	0	0.0	0.0	560.0	0	0.0
Georgia	0.2	534.9	0	0.0	5.9	2,044.5	0	0.0
Idaho	20.1	6,586.1	0	0.0	85.1	6,482.9	3	142.2
Illinois	0.0	40.0	0	0.0	5.8	743.6	1	166.4
Indiana	0.0	85.0	0	0.0	1.0	61.1	0	0.0
Kentucky	9.9	494.5	0	0.0	4.8	758.5	0	0.0
Louisiana	0.1	77.5	0	0.0	2.0	837.2	5	363.3
Maine	0.0	52.0	0	0.0	0.0	39.0	0	0.0
Michigan	2.9	438.4	0	0.0	14.7	1,779.7	1	77.4
Minnesota	4.2	246.1	0	0.0	10.9	1,943.3	1	25.2
Mississippi	0.0	73.1	0	0.0	8.0	987.2	1	81.6
Missouri	0.0	0.0	0	0.0	35.5	902.3	0	0.0
Montana	36.4	7,446.1	0	0.0	77.1	8,612.7	4	65.5
Nebraska	0.0	0.0	0	0.0	0.9	60.9	0	0.0
Nevada	0.0	79.8	0	0.0	0.6	98.2	2	77.4
New Hampshire	0.8	254.1	0	0.0	0.7	148.2	0	0.0
New Mexico	3.3	1,223.1	0	0.0	22.8	2,946.3	0	0.0
North Carolina	2.5	438.8	0	18.5	27.6	840.2	0	0.0
Ohio	0.2	271.1	0	0.0	0.0	0.0	1	12.5
Oklahoma	0.0	0.0	0	0.0	0.0	0.0	0	0.0
Oregon	20.1	14,793.6	1	35.1	120.3	15,266.6	6	1,292.9
Pennsylvania	0.0	294.2	0	1.7	6.3	624.0	0	69.4
Puerto Rico	0.0	0.0	0	0.0	0.0	100.2	0	0.0
South Carolina	0.4	179.9	0	0.0	0.5	264.8	0	0.0
South Dakota	0.0	567.0	0	0.0	6.2	1,125.9	0	0.0
Tennessee	3.8	451.0	0	0.0	4.4	617.5	0	0.0
Texas	0.1	87.0	1	160.0	0.0	445.5	1	41.4
Utah	0.1	1,175.7	0	0.0	4.2	2,295.9	1	14.4
Vermont	0.1	107.2	0	0.0	0.0	125.4	0	4.1
Virginia	1.8	739.9	0	0.0	8.6	1,321.4	2	149.3
Washington	1.5	6,171.9	0	7.8	58.1	8,650.6	7	1,066.5
West Virginia	3.3	561.8	0	0.0	16.0	1,906.6	0	0.0
Wisconsin	0.5	754.2	0	0.0	3.4	1,806.8	1	181.7
Wyoming	3.5	646.4	0	0.0	3.6	1,121.7	0	0.0
Total	135.7	57,626.8	4	481.2	720.9	89,422.0	44	4,422.9

See footnotes at end of table.

Tables: National Forest System

Table 42--Road and bridge construction and reconstruction by State--fiscal year 1990--Continued

By Timber Purchasers								State, Commonwealth, or Territory 2/
Construction				Reconstruction				
Roads		Bridges		Roads		Bridges		
Miles 3/	Cost	No.	Cost	Miles 3/	Cost	No.	Cost	
1000 dollars		1000 dollars		1000 dollars		1000 dollars		
0.0	0.0	0	0.0	35.7	447.9	0	0.0	Alabama
84.2 4/	9,062.1 4/	9	320.0	39.0 4/	285.0 4/	1	80.0	Alaska
14.1	117.4	0	0.0	267.2	1,284.4	0	0.0	Arizona
34.9	366.1	0	0.0	76.7	612.5	0	0.0	Arkansas
114.1	3,674.1	0	0.0	390.5	5,548.1	2	100.0	California
64.3	1,003.6	0	0.0	24.8	155.1	0	0.0	Colorado
0.0	0.0	0	0.0	23.8	383.8	0	0.0	Florida
3.6	77.9	0	0.0	5.3	79.7	0	0.0	Georgia
222.5	6,626.6	0	0.0	292.8	3,185.2	1	1.5	Idaho
1.7	32.1	0	0.0	3.0	32.2	0	0.0	Illinois
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Indiana
15.7	202.3	0	0.0	31.9	255.5	0	0.0	Kentucky
3.3	85.5	0	0.0	66.6	1,005.8	0	0.0	Louisiana
0.0	0.0	0	0.0	1.8	9.9	0	0.0	Maine
17.3	136.7	0	0.0	64.0	462.5	0	0.0	Michigan
10.4	213.0	0	0.0	20.4	153.6	0	0.0	Minnesota
5.4	234.8	0	0.0	92.4	1,075.1	0	0.0	Mississippi
0.0	0.0	0	0.0	24.9	108.0	0	0.0	Missouri
113.6	2,827.5	0	0.0	127.9	915.6	2	31.4	Montana
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Nebraska
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Nevada
1.9	73.3	1	18.6	6.1	80.8	0	0.0	New Hampshire
53.6	525.3	0	0.0	147.2	607.4	0	0.0	New Mexico
11.9	222.8	0	0.0	21.6	186.7	0	0.0	North Carolina
0.6	17.0	0	0.0	0.0	0.0	0	0.0	Ohio
1.9	18.6	0	0.0	0.5	4.6	0	0.0	Oklahoma
477.7	25,286.6	0	0.0	1,308.7	29,085.1	3	409.8	Oregon
20.6	546.7	0	0.0	62.8	629.5	0	0.0	Pennsylvania
0.0	0.0	0	0.0	0.0	0.0	0	0.0	Puerto Rico
3.2	141.0	0	0.0	41.3	303.2	0	0.0	South Carolina
38.6	616.8	0	0.0	102.2	697.7	0	0.0	South Dakota
12.2	151.2	0	0.0	32.0	125.3	0	0.0	Tennessee
1.1	29.8	0	0.0	52.2	382.6	0	0.0	Texas
18.3	270.6	0	0.0	42.7	347.5	0	0.0	Utah
1.4	19.9	0	0.0	0.1	15.6	0	0.0	Vermont
3.5	42.6	0	0.0	14.9	106.6	2	0.0	Virginia
373.2	13,982.9	0	0.0	213.2	2,600.2	0	60.0	Washington
12.2	517.4	0	0.0	17.8	292.6	0	0.0	West Virginia
17.5	84.2	0	0.0	21.5	111.0	0	0.0	Wisconsin
34.1	310.5	0	0.0	41.8	162.5	1	32.9	Wyoming
1,788.6	67,516.9	10	338.6	3,715.3	51,738.8	12	715.6	Total

1/ Includes funds for engineering and program support for appropriated roads and timber purchaser roads. Does not include \$7,226,069 of Washington Office funds and \$607,000 transferred to the Federal Highway Administration (FHWA). The FHWA funds provided for A&E planning and design for future year projects.

2/ States not listed had no Forest Service road programs in 1990.

3/ Does not include 41.4 miles of construction and 117.4 miles of reconstruction turned back to the Forest Service (Purchaser Election Program).

4/ Does not include Tongass Timber Supply Fund, \$14,802,600 (0.9 miles of construction and 25.5 miles of reconstruction).

Report of the Forest Service

Table 43—Purchaser election roads constructed by the Forest Service by State--fiscal year 1990 1/

State or Commonwealth 2/	Construction		Reconstruction	
	Roads		Roads	
	Miles	Cost	Miles	Cost
		1000 dollars		1000 dollars
Alabama	0.0	0.0	0.0	5.3
Alaska	0.0	0.0	0.0	0.0
Arizona	0.0	0.0	0.0	0.0
Arkansas	0.0	0.0	0.0	0.8
California	0.0	0.0	0.0	0.0
Colorado	1.2	76.8	0.8	53.0
Florida	0.0	0.0	5.8	62.3
Georgia	0.0	8.5	0.0	31.3
Idaho	16.0	94.4	14.7	249.0
Illinois	0.0	0.0	0.0	0.0
Indiana	0.0	0.0	0.0	0.0
Kentucky	1.1	24.6	3.1	34.0
Louisiana	0.6	19.7	11.3	118.6
Maine	1.7	98.3 3/	1.6	15.3
Michigan	0.0	0.0	0.0	0.0
Minnesota	0.0	0.0	0.0	0.0
Mississippi	2.2	27.9	7.8	159.5
Missouri	0.0	0.0	0.0	0.0
Montana	0.0	23.5	0.0	0.0
Nebraska	0.0	0.0	0.0	0.0
Nevada	0.0	0.0	0.0	0.0
New Hampshire	2.9	129.1 4/	1.4	21.0
New Mexico	0.0	0.0	0.0	0.0
North Carolina	0.8	16.1	1.5	17.5
Ohio	0.3	2.5	1.4	13.4
Oklahoma	0.0	0.0	0.0	0.0
Oregon	2.3	353.2	17.6	306.0
Pennsylvania	0.0	0.0	0.0	0.0
Puerto Rico	0.0	0.0	0.0	0.0
South Carolina	0.0	0.0	0.0	0.0
South Dakota	6.6	78.6	18.6	183.8
Tennessee	2.3	51.9	0.2	1.7
Texas	1.0	20.0	2.3	107.2
Utah	0.0	2.8	17.6	38.7
Vermont	0.0	0.0	0.0	0.0
Virginia	0.0	0.0	0.0	0.0
Washington	0.5	36.7	11.7	219.9
West Virginia	1.9	160.7	0.0	0.0
Wisconsin	0.0	0.0	0.0	0.0
Wyoming	0.0	0.0	0.0	0.0
Total	41.4	1,225.3	117.4	1,638.3

1/ Does not include change orders or contract amendments of \$82,000.

2/ States not listed had no timber purchaser roads constructed by the Forest Service in 1990.

3/ Includes 2 bridges.

4/ Includes 1 bridge.



Table 44—Road maintenance by State--fiscal year 1990

State	Cost			Miles fully maintained 1/			Miles lacking full maintenance 2/			Total Miles
	Level 1 Closed 3/	Level 2 High Clearance 4/	Levels 3,4,5 Passenger Car 5/	Level 1 Closed	Level 2 High Clearance	Levels 3,4,5 Passenger Car	Level 1 Closed	Level 2 High Clearance	Levels 3,4,5 Passenger Car	
1000 dollars										
Alabama	9.9	68.6	436.6	170.0	380.0	487.0	120.0	239.0	193.0	1,589.0
Alaska 6/	40.4	127.9	1,017.6	487.1	642.3	486.1	659.8	516.4	39.2	2,830.9
Arizona	141.9	671.5	3,299.3	889.5	2,166.6	3,045.1	7,183.5	14,632.7	1,170.1	29,087.5
Arkansas	15.8	131.6	1,499.5	544.0	3,425.0	718.0	240.0	1,424.0	900.0	7,251.0
California	1,553.9	2,779.2	11,293.9	2,869.5	10,546.1	7,591.3	3,539.7	14,268.7	5,441.7	44,257.0
Colorado	411.5	1,093.8	1,841.0	1,164.5	2,916.0	2,873.1	1,844.6	6,199.1	2,296.1	17,293.4
Florida	10.2	8.7	518.4	63.0	97.0	620.0	0.0	3,126.0	641.0	4,547.0
Georgia	25.0	214.4	643.4	0.0	171.0	363.0	119.0	542.0	242.0	1,437.0
Idaho	477.1	1,220.6	4,621.5	4,143.5	6,364.9	6,303.7	3,755.0	8,232.5	3,848.0	32,647.6
Illinois	41.2	77.2	194.2	273.0	273.5	94.0	250.0	265.0	92.8	1,248.3
Indiana	0.0	0.0	24.3	35.0	0.0	30.0	0.0	0.0	10.0	75.0
Kansas	0.0	7.1	0.0	0.0	16.0	8.0	0.0	183.0	42.0	249.0
Kentucky	3.0	13.5	489.9	262.0	268.0	355.0	50.0	78.0	150.0	1,163.0
Louisiana	7.7	107.6	598.4	211.0	1,452.0	499.0	11.0	298.0	216.0	2,687.0
Maine	7.5	1.5	57.0	27.0	7.0	23.0	2.0	0.7	10.2	69.9
Michigan	35.9	178.8	1,262.4	1,015.8	1,415.7	689.9	2,882.0	3,673.3	695.3	10,372.0
Minnesota	94.3	86.1	1,022.7	123.8	125.5	698.4	1,314.2	1,797.3	433.0	4,492.2
Mississippi	17.1	128.1	320.2	313.0	431.0	502.0	358.0	392.0	417.0	2,413.0
Missouri	3.0	163.0	186.0	0.0	800.0	520.0	112.0	1,056.0	200.0	2,688.0
Montana	1,631.0	612.5	4,283.0	2,997.0	6,656.0	5,752.0	2,795.0	6,620.0	5,154.0	29,974.0
Nebraska	2.1	29.2	95.0	11.2	59.6	72.3	0.0	193.3	42.2	378.6
Nevada	28.0	132.9	485.3	206.0	794.0	604.0	90.0	2,338.0	688.0	4,720.0
New Hampshire	41.1	15.6	179.4	130.0	71.2	99.0	29.5	10.0	38.8	378.5
New Mexico	131.5	1,354.3	1,721.5	2,384.8	2,715.8	1,356.1	1,963.4	12,578.0	1,925.7	22,923.8
New York	0.0	0.0	0.5	0.0	0.0	0.0	1.3	0.2	1.4	2.9
North Carolina	7.3	146.3	577.9	145.0	846.0	52.0	22.0	128.0	784.0	1,977.0
North Dakota	0.0	14.7	11.5	0.0	90.0	445.0	0.0	274.0	90.0	899.0
Ohio	0.0	0.0	45.4	43.0	0.0	22.0	0.0	2.0	3.0	70.0
Oklahoma	0.1	6.7	71.5	43.0	300.0	96.0	4.0	193.0	107.0	743.0
Oregon	999.0	3,631.0	11,821.0	9,508.0	22,062.0	9,619.0	5,178.0	19,514.0	2,569.0	68,450.0
Pennsylvania	14.1	48.1	398.8	85.1	258.4	392.9	72.9	62.4	101.9	973.6
Puerto Rico	0.0	0.0	68.5	0.0	0.0	0.0	0.0	0.0	38.0	38.0
South Carolina	92.1	90.3	887.1	0.0	0.0	0.0	533.0	154.0	988.0	1,675.0
South Dakota	25.1	224.1	497.8	48.0	628.0	460.0	351.0	2,229.6	427.0	4,143.6
Tennessee	20.6	49.5	667.3	40.0	414.0	430.0	13.0	471.0	71.0	1,439.0

See footnotes at end of table.

Table 44—Road maintenance by State--fiscal year 1990--Continued

State	Cost			Miles fully maintained 1/				Miles lacking full maintenance 2/				Total Miles
	Level 1 Closed 3/	Level 2 High Clearance 4/	Levels 3,4,5 Passenger Car 5/	Level 1 Closed	Level 2 High Clearance	Levels 3,4,5 Passenger Car	Level 1 Closed	Level 2 High Clearance	Levels 3,4,5 Passenger Car			
1000 dollars												
Texas	10.7	170.2	505.6	195.0	675.0	25.0	0.0	1,187.0	428.0	2,510.0		
Utah	46.4	431.6	1,919.9	124.3	3,472.9	2,118.3	405.0	4,157.5	1,057.9	11,335.9		
Vermont	12.4	26.8	172.4	0.0	0.0	0.0	51.6	97.3	83.9	232.8		
Virginia	36.4	121.0	809.3	139.0	198.0	203.0	220.0	1,229.0	761.0	2,750.0		
Washington	346.2	2,319.2	4,999.2	2,395.0	6,672.0	4,670.0	1,274.0	4,857.0	2,069.0	21,937.0		
West Virginia	9.3	42.4	1,068.8	216.4	555.3	663.2	34.0	145.8	91.9	1,706.6		
Wisconsin	28.6	200.1	990.0	410.0	1,828.0	1,059.0	142.0	1,748.0	1,693.0	6,880.0		
Wyoming	74.4	309.1	1,307.3	1,014.4	4,377.0	1,172.0	659.0	1,668.0	1,618.9	10,509.3		
Total 7/	6,451.8	17,054.8	62,910.3	32,726.9	84,170.8	55,217.4	36,279.5	116,780.8	37,870.0	363,045.4		

1/ Includes miles of road maintained at a level consistent with current uses.

2/ Includes miles of road maintained at a level less than adequate for current uses.

3/ Roads closed to motorized traffic.

4/ Roads maintained for use by high clearance vehicles.

5/ Roads maintained for passenger car use.

6/ Does not include Tongass Timber Supply Fund, \$151,600 and 101.1 miles.

7/ Does not include \$875,946 of Washington Office funds.

Report of the Forest Service

Table 45—State and Private Forestry funding--fiscal year 1990 compared to long-term program costs

	1990 Actual 1/	1995 RPA 2/ <i>1,000 constant 1990 dollars</i>	Percent of 1990 Actual to 1995 RPA
Appropriated accounts			
Forest pest mangement	47,586	64,000 3/	74
Fire protection	17,078	20,000	85
Forest management and utilization	25,321	189,000	13
Special projects	19,663	- 4/	N/A 5/
Subtotal	109,648	273,000	40
Transfer accounts			
Rural community fire protection	3,091	- 6/	N/A
Watershed and flood prevention	2,698	-	N/A
Watershed planning	228	-	N/A
Resource conservation and development	724	-	N/A
River basin surveys and investigations	852	-	N/A
Forestry Incentives Program 7/	1,245	-	N/A
Agricultural Conservation Program 7/	1,730	-	N/A
Subtotal	10,568	-	N/A
Total	120,216	N/A	N/A

1/ Post sequestration with supplemental.

2/ Information from 1990 RPA Program

2/ Includes both cooperative and Federal pest management.

4/ Included in forest management and utilization.

5/ Not applicable.

6/ Not reported in the 1990 RPA.

7/ Includes only technical assistance allocated for the Forestry Incentives and Agricultural Conservation Programs (administered jointly by ASCS and FS).

Tables: State and Private Forestry

Table 46—State and Private Forestry funding--fiscal years 1986-90

	1990	1989	1988	1987	1986
	<i>1,000 dollars</i>				
Appropriated accounts					
Forest pest management	47,586	49,677	44,441	38,462	28,329
Fire protection	17,078	13,851	13,770	13,661	13,032
Forest management and utilization	25,321	10,265	10,783	10,026	9,518
Special projects	19,663	12,875	10,875	4,405	4,442
Subtotal	109,648	86,668	79,869	66,554	55,321
Transfer accounts					
Rural community fire protection	3,091	3,091	3,091	3,091	3,110
Watershed and flood prevention	2,698	3,198	2,777	3,884	3,948
Watershed planning	228	228	241	211	221
Resource conservation and development	724	766	803	643	693
River basin surveys and investigations	852	852	852	869	1,040
Forestry Incentives Program 1/	1,245	1,245	1,189	1,218	1,196
Agricultural Conservation Program 1/	1,730	1,769	1,769	1,800	1,818
Subtotal	10,568	11,149	10,722	11,716	12,026
Total	120,216	97,817	90,591	78,270	67,347

1/ Includes only technical assistance allocated for the Forestry Incentives and Agricultural Conservation Programs (administered jointly by ASCS and FS).

Table 47—Summary of State and Private Forestry 1990 accomplishments compared to long-term program levels

	Unit of measure	2/	1990 Actual	1990 Funded	Percent of 1990 Actual Funded	1989 Actual	1995 RPA	Percent change comparison	
								1/ 1989 Actual to 1990 Actual	1990 Actual to 1995 RPA
Appropriated accounts									
Forest pest management	3/								
Insect and disease management surveys	MM acres		595	600	101	571.1	N/A	4	N/A
Insect and disease suppression	MM acres		1.7	- 4/	-	1.1	N/A	55	N/A
Insect and disease special projects	Projects		35	-	-	32	N/A	9	N/A
Forest management and utilization									
Forest resource management									
Forest Land management plans	MM acres		3.5	4.2	120	4.2	9	-17	157
Timber harvested	MM cubic feet		384	-	-	346	N/A	11	N/A
Reforestation	5/		887	-	-	1,163	1,300	-24	47
Timber stand improvement	6/		187	-	-	232	870	-19	365
Woodland owners assisted	M owners		149	-	-	154	N/A	-3	N/A
Wood utilization	MM cubic feet		-	-	-	-	N/A	-	N/A
Seedling, nursery, and tree improvement	MM seedlings		550	985	179	852	N/A	-35	N/A
Urban forestry assistance	Areas assisted		8,736	7/	-	7,964	N/A	10	N/A
Management improvement									
State forest resource planning	Person Years		27	-	-	28	8/	-4	N/A
Transfer accounts									
Rural community fire protection, FmHA	M approved applications		3.4	3.4	100	3.4	N/A	0	N/A
Watershed and flood prevention, SCS	9/ Projects		70	72	103	81	N/A	-14	N/A
Watershed planning, SCS	Plans		66	57	86	78	N/A	-15	N/A
Resource conservation and development, SCS	Projects		60	60	100	60	N/A	0	N/A
River basin surveys and investigations, SCS	Plans		49	46	94	50	N/A	-2	N/A
Forestry Incentives Program, ASCS	10/								
Reforestation	M acres		161	-	-	121	N/A	11/ 33	N/A
Timber stand improvement	M acres		30	-	-	26.1	N/A	15	N/A
Agricultural Conservation Program, ASCS	10/								
Reforestation	M acres		144	-	-	130.7	N/A	10	N/A
Timber stand improvement	M acres		39	-	-	21.2	N/A	84	N/A

1/ Information from 1990 RPA Program.

2/ M = thousand, MM = million.

3/ Includes accomplishments on National Forest System and other Federal lands, as well as State and private lands.

4/ -- = not applicable.

5/ Includes Conservation Reserve Program, Forestry Incentives Program and Agricultural Conservation Program accomplishments.

6/ Includes Forestry Incentives Program and Agricultural Conservation Program accomplishments.

7/ Areas represent more than one assistance per community; e.g., New York, Philadelphia, etc.

8/ Includes Emergency Watershed Protection.

9/ Accomplishments for 1990 are estimates; actual data is not available from SCS.

10/ Same as footnote 9, except for agency.

11/ Not available.



Report of the Forest Service

**Table 48—Wildfires on State and private lands protected under the Cooperative Forestry Assistance Act (P.L. 95-313)--
calendar year 1989**

State, Commonwealth, or Territory	Acres protected <i>1,000 acres</i>	Lightening fires <i>Number</i>	Person-caused fires <i>Number</i>	Total fires <i>Number</i>	Acres burned <i>Number</i>
Alabama	25,726	60	4,474	4,534	41,901
Alaska	134,000	19	363	382	57,435
Arizona	22,447	106	551	657	45,619
Arkansas	19,728	34	3,164	3,198	43,496
California	32,057	266	6,369	6,635	73,601
Colorado	25,958	182	1,585	1,767	56,712
Connecticut	2,390	0	1,006	1,006	2,782
Delaware	557	0	26	26	556
Florida	25,380	1,203	6,088	7,291	645,331
Georgia	27,279	157	7,168	7,325	37,783
Guam	8,164	0	639	639	4,428
Hawaii	3,306	4	128	132	670
Idaho	6,026	368	158	526	7,368
Illinois	10,670	5	633	638	6,605
Indiana	7,328	0	139	139	632
Iowa	7,612	8	1,886	1,894	3,471
Kansas	198	51	4,677	4,728	13,793
Kentucky	16,936	3	1,201	1,204	24,249
Louisiana	12,285	5	6,296	6,301	87,534
Maine	17,743	64	587	651	2,403
Maryland	3,555	3	458	461	3,500
Massachusetts	3,581	18	2,440	2,458	3,382
Michigan	20,600	52	658	710	4,560
Minnesota	22,800	30	1,496	1,526	28,803
Mississippi	19,858	6	4,761	4,767	68,184
Missouri	16,587	13	3,396	3,409	47,396
Montana	48,633	288	260	548	3,072
Nebraska	49,084	198	2,021	2,219	195,909
Nevada	4,028	54	103	157	1,642
New Hampshire	4,631	4	586	590	556
New Jersey	3,150	2	1,001	1,003	6,758
New Mexico	42,500	317	810	1,127	278,226
New York	16,958	3	600	603	11,730
North Carolina	19,540	32	2,610	2,642	14,442
North Dakota	31,879	51	556	607	12,404
Ohio	5,822	1	582	583	3,226
Oklahoma	5,080	18	2,568	2,586	59,497
Oregon	13,129	200	807	1,007	21,587
Pennsylvania	19,541	1	1,326	1,327	9,527
Puerto Rico	829	0	7,592	7,592	12,405
Rhode Island	433	1	190	191	254
South Carolina	12,558	55	4,720	4,775	22,203
South Dakota	20,653	228	685	913	14,779
Tennessee	26,479	8	1,865	1,873	15,894
Texas	22,123	15	2,447	2,462	42,024
Utah	15,000	296	186	482	3,751
Vermont	4,638	0	129	129	418

Tables: State and Private Forestry

**Table 48—Wildfires on State and private lands protected under the Cooperative Forestry Assistance Act (P.L. 95-313)--
calendar year 1989--Continued**

State, Commonwealth, or Territory	Acres protected <i>1,000 acres</i>	Lightening fires <i>Number</i>	Person-caused fires <i>Number</i>	Total fires <i>Number</i>	Acres burned <i>Number</i>
Virginia	18,325	19	984	1,003	4,123
Washington	12,500	223	1,111	1,334	8,705
West Virginia	12,833	1	1,175	1,176	18,915
Wisconsin	18,921	87	2,095	2,182	4,184
Wyoming	29,109	163	1,313	1,476	25,088
Total	951,147	4,922	98,669	103,591	2,103,513



Report of the Forest Service

Table 49--Pesticide use report--fiscal year 1990

Common name	Target pest or purpose	Quantity used	Units treated 1/	
		Pounds 2/		
Herbicides:				
Acifluorfen	Farm weed control	24.00	94.00	
Amitrole	Noxious weed control	2.00	2.00	
Ammonium sulfamate	Wildlife habitat improvement	128.00	128.00	
Atrazine	General weed control	576.00	273.00	
Benefin	Noxious weed control	1.00	1.00	
Bentazon	Farm weed control	47.00	94.00	
Bifenox	Nursery weed control	50.30	48.00	
Butylate	General weed control	216.00	37.00	
Chlorimuron ethyl	Farm weed control	2.00	32.00	
Dacthal 3/	Nursery weed control	255.30	26.35	
Dicamba	General weed control	3.00	1.50	
	Noxious weed control	148.10	331.00	
	Rights-of-way	4.00	4.00	
	Site preparation	32.00	230.00	
	Wildlife habitat management	33.00	1,166.00	
Dicamba/	Noxious weed control	75.00	100.00	
Picloram		25.00		
Diphenamid	Nursery weed control	244.60	34.72	
Diquat	Aquatic weed control	22.00	28.00	acre feet
Diuron	Rights-of-way	192.00	40.00	
Eptc	General weed control	759.00	127.00	
Fluazifop-p-butyl	Noxious weed control	3.00	17.00	
Fosamine ammonium	Noxious weed control	17.00	5,000.00	square feet
	Rights-of-way	711.30	85.25	
	Rights-of-way	656.00	262.19	side miles
	Wildlife habitat improvement	120.00	10.00	
Fosamine ammonium/	Rights-of-way	99.50	39.00	
Imazapyr		6.50		
Glyphosate	Aquatic weed control	144.00	18.00	
	Conifer release	1,501.22	2,097.00	
	General weed control	556.92	308.00	
	General weed control	8.00	2.00	side miles
	Hardwood release	346.14	439.10	
	Noxious weed control	1,356.26	1,001.20	
	Nursery weed control	216.00	84.00	
	Poisonous plant control	25.25	15.50	
	Range management	395.00	278.00	
	Research	1.00	1.00	
	Rights-of-way	541.10	184.00	
	Site preparation	2,818.75	3,033.00	
	Thinning	860.00	477.00	
	Wildlife habitat improvement	844.00	497.00	
Glyphosate/	Rights-of-way	0.50	1.50	
Hexazinone/		0.50		
Triclopyr		1.30		
Glyphosate/	Rights-of-way	6.00	3.00	
Imazapyr		6.00		
Glyphosate/	Conifer release	1.00	1.00	
Oust		1.00		

See footnotes at end of table

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used	Units treated 1/	
		Pounds 2/		
Herbicides: (Cont.)				
Glyphosate/ Triclopyr	Site preparation	9.00	126.00	
		79.00		
Harmony	Farm weed control	1.00	17.00	
Hexazinone	Conifer release	5,281.00	4,334.00	
	Hardwood release	2.00	1.00	
	Research	2.00	1.00	
	Rights-of-way	135.50	11.60	
	Rights-of-way	2.00	23.00	side miles
	Site preparation	11,157.00	6,139.00	
	Wildlife habitat improvement	241.00	227.00	
	Conifer release	62.00	458.00	
Hexazinone/ Sulfometuron methyl		9.00		
Hexazinone/ Triclopyr	Conifer release	40.60	659.00	
		315.00		
	Site preparation	23.50	184.00	
		123.00		
Imazaquin	Farm weed control	24.00	186.00	
Imazapyr	Conifer release	199.00	1,632.00	
	General weed control	8.00	15.00	
	Rights-of-way	61.00	112.00	
	Site preparation	838.90	1,032.00	
Linuron	General weed control	20.00	21.00	
MCPA	General weed control	170.00	85.00	
Metolachor	Range management	233.00	117.00	
Metribuzin	Farm weed control	9.00	32.00	
Metsulfuron methyl	Poisonous plant control	1.00	0.50	
Napropamide	Nursery weed control	107.50	35.80	
Naptalam	Farm weed control	92.00	92.00	
Oryzalin	General weed control	3.00	2.00	side miles
Oxyflourfen	Nursery weed control	110.00	92.00	
Pendimethalin	Farm weed control	52.00	62.00	
Picloram	Conifer release	8.10	23.00	
	Noxious weed control	1,454.02	4,056.90	
	Poisonous plant control	24.40	82.00	
	Rights-of-way	10.00	91.00	
	Site preparation	30.10	28.00	
	Noxious weed control	0.10	0.40	
Picloram/ 2,4-DP		1.00		
Picloram/ Triclopyr	Rights-of-way	8.00	137.00	
		16.00		
Prometon	General weed control	40.00	2.00	
Quizalfop ethyl	Farm weed control	3.00	18.00	
Sethoxydim	Noxious weed control	8.00	28.00	
	Nursery weed control	20.00	75.00	
	Aquatic weed control	16.00	8.00	acre feet
Simazine	Conifer release	2.02	8.00	
	General weed control	2.39	1,200.00	square feet
	Nursery weed control	4.00	1.00	

See footnotes at end of table.

Report of the Forest Service

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used	Units treated 1/			
		Pounds 2/				
Herbicides: (Cont.)						
Sulfometuron methyl	Conifer release	54.05	1,774.00	side miles		
	General weed control	0.14	1.00			
	Noxious weed control	3.00	120.00			
	Research	0.75	12.00			
	Rights-of-way	7.64	66.00			
	Rights-of-way	0.75	23.00			
Tebuthiuron	Range management	50.00	100.00			
	Rights-of-way	149.00	29.00			
Trifluralin	General weed control	124.00	124.00			
Triclopyr	Conifer release	15,222.51	18,990.00	side miles		
	General weed control	83.00	91.00			
	Hardwood release	4,164.00	5,125.00			
	Noxious weed control	598.50	189.00			
	Range management	14.00	8.00			
	Research	4.00	4.00			
	Rights-of-way	844.90	155.30			
	Rights-of-way	247.00	90.60			
	Site preparation	22,601.96	22,437.00			
	Thinning	1,777.00	1,026.00			
	Wildlife habitat improvement	1,683.62	5,381.00			
	Wildlife habitat management	30.00	2,004.00			
	2,4-D	Aquatic weed control	76.00		5.00	trees
		General weed control	17.00		34.00	
		Hardwood release	2.00		4.00	
Noxious weed control		1,064.70	946.95			
Nursery weed control		1.00	1.00			
Poisonous plant control		400.00	200.00			
Rights-of-way		15.00	120.00			
Wildlife habitat improvement		32.00	16.00			
2,4-D/ Dicamba	General weed control	2.00	1.00			
		0.50				
	Noxious weed control	3,637.00	3,163.33			
2,4-D/ Dicamba/ Picloram		1,340.19				
	Poisonous plant control	12.00	15.00			
		4.00				
	Noxious weed control	3.00	150.00			
2,4-D/ Diuron/ Telar		3.00				
		1.50				
	Rights-of-way	2.00	137.00			
2,4-D/ Glyphosate		3.00				
		0.30				
	General weed control	35.00	35.00			
2,4-D/ MCPA		42.00				
	Rights-of-way	3.00	12.00			
		6.00				
2,4-D/ MCPA	General weed control	1.68	5.25			
		1.68				

See footnotes at end of table.

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used	Units treated 1/	
		Pounds 2/		
Herbicides: (Cont.)				
2,4-D/ Picloram	General weed control	2.19	15.00	
		0.50		
	Noxious weed control	3,696.13	3,135.37	
		785.20		
	Noxious weed control	156.00	78.00	side miles
		20.00		
	Poisonous plant control	76.90	152.00	
		32.39		
	Rights-of-way	314.00	170.00	side miles
		42.00		
	Wildlife habitat improvement	3.00	72.00	
		1.00		
2,4-D/ Triclopyr/ Picloram	Rights-of-way	46.00	43.00	
		159.00		
		12.00		
2,4-DB	Farm weed control	6.00	94.00	
Total 1990 herbicide use		94,858.35	95,570.52	*

* Plus:

2,004 trees
650.79 side miles
36 acre feet
6,200 square feet

See footnotes at end of table.

Report of the Forest Service

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Insecticides:				
Azinphos-methyl	Cone moth	853.50	569.00	(A)
<i>Bacillus thuringiensis</i>	Gypsy moth	282,032.00	19,179.00	(A)
Carbaryl	Grasshoppers	3,620.00	7,240.00	(A)
	Mormon cricket	16,750.00	33,500.00	(A)
Diflubenzuron	Gypsy moth	58.00	1,905.00	(A)
Disparlure	Gypsy moth	167.57	250.00	(A)
Fenvalerate	Cone borers	12.00	16.00	(A)
Malathion	Grasshoppers	6,456.00	12,912.00	(A)
Nucleopolyhedrosis virus	Gypsy moth	55 trillion	275.00	(A)
Pyrethrins	Cone moth	106.20	560.00	(A)
Acephate	Aphids	0.20	24.00	
	Aphids	0.34	94,655.00	seedlings
	Cone and seed insects	3.40	17.00	
	Cone and seed insects	132.00	1,228.00	trees
	Greenhouse insects	0.25	840.00	seedlings
	Seedbugs	176.00	44.00	
	Tent caterpillars	2.50	20.00	
	Western spruce budworm	291.63	1,288.00	trees
Amdro	Ants	1.00	1.00	
	Imported fire ant	0.43	260.00	treatment stations
Bendiocarb	Fleas	0.75	370.00	burrows
	Fleas	0.75	140.00	dusting stations
<i>Bacillus thuringiensis</i> <i>var. israelensis</i>	Mosquitoes	1.00	20.00	
Carbaryl	Aphids	1.66	696,124.96	seedlings
	Fleas	15.00	150.00	
	Grasshoppers	709.00	387.00	
	Hardwoodors defoliators	12.00	12.00	
	Mormon cricket	2,339.00	5,477.00	
	Mountain pine beetle	2.50	1.00	
	Mountain pine beetle	552.50	5.00	tree groups
	Mountain pine beetle	55.00	500.00	trees
	Spruce beetle	9.00	15.00	
	Western pine beetle	80.00	30.00	
	Western pine beetle	97.00	800.00	trees
Chlorpyrifos	Ants	30.00	5.00	buildings
	Ants	2.00	50.00	square feet
	Cutworms	78.00	60.00	
	Pales weevil	4.00	17.00	
	Southern pine beetle	191.00	5,441.00	trees
	Webworms	24.00	21.00	
Diazinon	Aphids	1.79	8.00	greenhouses
	Cutworms	23.00	3.00	
	Fleas	100.00	135.00	
	Fleas	0.03	280.00	burrows
	Nursery insects	70.00	140.89	
	Seedbugs	1.00	2,850.00	pounds of seed
Fenbutatin-oxide	Spider mites	0.40	1,500.00	seedlings

See footnotes at end of table.

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Insecticides: (Cont.)				
Fenvalerate	Cone moth	0.82	83.00	
	Cone and seed insects	8.00	30.00	
	Nursery insects	6.91	64.00	
Lindane	Ash (lilac) borer	5.00	15.00	trees
	Cone and seed insects	0.43	3,450.00	grafts
	Cone moth	0.14	35.00	
	Seedbugs	65.00	20.00	
	Seedworms	2.00	2,850.00	pounds of seed
	Southern pine beetle	254.00	160.00	
	Wood borer	0.02	500.00	grafts
Malathion	Aphids	1.00	2.00	
	Scales	5.00	2.00	
	Seedbugs	400.00	88.00	
	Thrips	1.89	413,460.00	seedlings
Methoxychlor	Mosquitoes	0.83	32.00	head of cattle
Methyl bromide	Texas leaf-cutting ant	288.00	16.00	
Permethrin	Cutworms	3.00	22.00	
	Seedbugs	2.85	1,000.00	trees
Petroleum oil	Aphids	7.00	1.00	
Pheromones	Mountain pine beetle	21.54	50.00	
	Mountain pine beetle	2.64	60.00	bait stations
	Mountain pine beetle	0.39	15.00	trees
	Tussock moth	0.09	57.00	treatment stations
	Wood borer	1.98	9.00	
	Ants	0.18	5.00	
Pyrethrins	Miscellaneous insects	0.10	100.00	buildings
Total 1990 insecticide use (including aerial use)		34,109.21 *	83,562.89 **	
Total aerial use		28,023.27	76,406.00	

* Pounds only; does not include 28,033 BIU's or 55 trillion PIB's.

** Includes BIU use on 19,199 acres, PIB use on 275 acres, plus:

10,227 trees
 5 tree groups
 50 square feet
 32 head of cattle
 3,950 grafts
 105 buildings
 317 treatment stations
 8 greenhouses
 650 burrows
 1,206,579 seedlings
 5,700 pounds of seed
 140 dusting stations
 60 bait stations

See footnotes at end of table.

Report of the Forest Service

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Fungicides and Fumigants:				
Benomyl	Anthracnose	2.50	20.00	
	Botrytis	17.39	30.00	
	Damping-off	1.00	1.00	
	Greenhouse diseases	1.25	8.00	greenhouses
	Nursery fungi	579.27	158.60	
	Nursery fungi	463.00	7,445,000.00	seedlings
	Nursery root rot	36.00	17.60	
	Rhizoctonia	0.05	533.00	seedlings
	Seedling blights	30.50	13.18	
Benomyl/ DCNA	Botrytis	3.30	6.60	
		6.40		
Borax	<i>Fomes annosus</i>	17,068.00	25,183.00	
	<i>Fomes annosus</i>	1,254.19	18,783.00	stumps
Captan	Damping-off	53.00	30.00	
	Greenhouse diseases	15.50	8.00	greenhouses
	Nursery fungi	36.00	6.00	
	Rhizoctonia	0.50	269.00	seedlings
	Seedling root diseases	1.00	2,850.00	pounds of seed
Chlorothalonil	Botrytis	47.63	31.19	
	Lophodermium	210.00	94.00	
	Other diseases	6.00	15.00	
	Phoma blight	23.80	6.30	
	Nursery blight	28.50	6.40	
	Nursery fungi	63.00	75.00	
Dazomet	Damping-off	2,921.00	11.00	
	Nursery fungi	31,864.34	92.25	
	Nursery root rot	8,000.00	22.50	
DCNA	Botrytis	15.10	10.20	
	Botrytis	35.25	6.00	greenhouses
	Botrytis	5.55	563,220.00	seedlings
	Nursery fungi	0.50	0.50	
Dodine	Cherry leaf spot	1.00	1.00	
Fatty acids	Nursery blight	2.50	2.39	
Ferbam	Fusiform rust	839.00	75.00	
Maneb	Anthracnose	2.50	20.00	
Metalaxyl	Damping-off	0.50	313,300.00	seedlings
	Fusarium	0.50	0.40	
Methyl bromide/ Chloropicrin	Charcoal root disease	5,694.00	26.00	
		2,805.00		
	Nursery fungi	13,049.73	73.90	
		6,400.87		
	Nursery root rot	20,553.00	78.60	
		10,123.00		
	Other diseases	14.00	3,850.00	square feet
		28.00		
	Seedling root diseases	5,224.00	39.00	
		2,609.00		

See footnotes at end of table.

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Fungicides and Fumigants: (Cont.)				
Tcmtb	Nursery fungi	100.00	4.00	
Thiram	Damping-off	3.07	1,487.00	pounds of seed
Triadimefon	Fusiform rust	13.00	30.00	
	Fusiform rust	2.00	1,840.00	pounds of seed
	Sirococcus tip blight	2.19	0.25	
	White pine blister rust	2.25	12.00	
	White pine blister rust	0.43	18,432.00	trees
Total 1990 fungicide and fumigant use		130,259.06	26,192.86	*

* Plus:
6,177 pounds of seed
8,322,322 seedlings
18,783 stumps
18,432 trees
22 greenhouses
3,850 square feet

See footnotes at end of table.

Report of the Forest Service

Table 49--Pesticide use report--fiscal year 1990--Continued

Common name	Target pest or purpose	Quantity used Pounds 2/	Units treated 1/	
Predacides and Piscicides:				
Rotenone	Undesirable fish	28.00	31.00	
	Undesirable fish	18.49	683.00	acre feet
	Undesirable fish	17.00	20.00	stream miles
Sodium cyanide	Coyotes	0.31	43,575.00	
	Coyotes	0.15	7.00	treatment stations
Total 1990 predacide and piscicide use		63.95	43,606.00	
Repellents:				
Putrescent egg solids	Deer	7,126.73	18,906.00	
	Deer	3.93	20,000.00	seedlings
Total 1990 repellent use		7,130.66	18,906.00	
Rodenticides:				
Aluminum phosphide	Ground squirrels	1.65	150.00	
Diphacinone	Ground squirrels	0.01	310.00	
	Pocket gophers	1.06	3,197.00	
Strychnine	Pocket gophers	261.14	62,087.00	
	Pocket gophers	3.86	786.00	burrows
Thiram	Rabbits	100.00	6,627.00	pounds of seed
Zinc phosphide	Pocket gophers	0.03	5.00	
	Pocket gophers	0.06	5.00	tree groups
Total 1990 rodenticide use		367.81	65,749.00	
Grand total pesticide use		266789.04	333587.27	

1/ Acres, unless other units are indicated. Aerial applications are indicated by (A). All others are ground application.

2/ Pounds, unless other units are indicated. BIU = billion international units. PIB = polyhedral inclusion bodies.

3/ Registered trademark; no common name.

Table 50—Summary of selected cooperative forest management and processing program activities--selected fiscal years

	Woodland owners assisted	Timber sale assistance-- volume marked MBF 1/	Loggers and processors assisted
1945	8,093	411,330	0
1950	22,828	518,566	0
1955	34,828	549,373	8,182
1960	82,188	569,178	8,099
1965	99,074	716,950	9,248
1970	115,197	1,225,520	13,620
1971	127,828	860,950	14,627
1972	274,001	955,627	5,290
1973	106,422	1,578,664	4,855
1974	117,990	907,311	5,353
1975	140,940	677,532	5,405
1976	105,184	596,599	15,318
1976 -77 (T.Q.) 2/	25,253	220,649	5,849
1977	133,619	921,171	29,101
1978	165,329	1,120,743	12,749
1979	183,585	755,103	11,393
1980	176,385	870,964	11,582
1981	164,279	683,181	18,609
1982	141,472	841,475	15,470
1983	136,265	872,125	8,717
1984	151,539	1,033,440	10,082 3/
1985	134,338	913,411	- 4/
1986	137,753	855,813	- 4/
1987	158,353	1,225,896	- 4/
1988	167,432	890,581	- 4/
1989	153,855	1,242,564	- 4/
1990	148,673	1,597,931	- 4/

1/ MBF = thousand board feet.

2/ Transition quarter.

3/ Not all states reported.

4/ Inadequate data due to lack of State grants in wood utilization program.

Report of the Forest Service

Table 51—Summary of selected cooperative forest management and processing activities by Region—fiscal year 1990

Assistance activity	Unit of measure 1/	Regions				
		Northern	Rocky Mountain	South-western	Inter-mountain	Pacific Southwest
Woodland owners assisted	Number	5,144	3,102	240	667	3,640
Forest management plans prepared	Number	507	500	33	41	141
	Acres	28,925	23,267	17,218	4,250	35,349
Reforestation:						
Planting	Acres	1,154	1,668	427	183	6,166
Seeding	Acres	0	7	0	0	6
Management for natural regeneration	Acres	285	4,440	5,213	75	3,954
Timber stand improvement	Acres	2,316	2,642	339	2,940	2,948
Outdoor recreation development	Acres	657	3,464	15,180	1,875	75
Wildlife habitat development	Acres	847	6,390	15,860	2,156	1,566
Forested range improvement	Acres	425	3,405	13,635	2,685	938
Timber sale assistance volume harvested	M cubic feet	3,198	5,754	2,144	550	14,810
Urban forestry assistance activities	Urban areas assisted	133	939	48	107	507
Referrals to consulting foresters	Number	99	182	45	15	785

See footnote at end of table.

Tables: State and Private Forestry

Table 51—Summary of selected cooperative forest management and processing activities by Region--fiscal year 1990--
Continued

Assistance activity	Unit of measure 1/	Regions				Total
		Pacific Northwest	Alaska	Southern	Northeastern Area	
Woodland owners assisted	Number	0	120	64,835	70,925	148,673
Forest management plans prepared	Number	955	91	48,083	19,154	69,505
	Acres	44,108	8,350	2,240,354	1,102,536	3,504,357
Reforestation:						
Planting	Acres	9,611	130	642,200	96,087	757,626
Seeding	Acres	0	0	27,912	734	28,659
Management for natural regeneration	Acres	0	240	56,628	30,000	100,835
Timber stand improvement	Acres	5,023	370	105,469	64,712	186,759
Outdoor recreation development	Acres	0	300	91,698	104,221	217,470
Wildlife habitat development	Acres	1,156	480	360,307	176,931	565,693
Forested range improvement	Acres	90	0	101,146	4,841	127,165
Timber sale assistance volume harvested	M cubic feet	23,623	12	655,787	78,112	783,990
Urban forestry assistance activities	Urban areas assisted	12	3	2,535	4,452	8,736
Referrals to consulting foresters	Number	69	5	6,439	9,316	16,955

1/ M = thousand.

Report of the Forest Service

Table 52--Summary of selected cooperative forest management and processing activities by State--fiscal year 1990

State, Commonwealth, or Territory 1/	Woodland owners assisted	Reforestation assistance	Timber stand improvement assistance	Timber sale assistance-- harvest volume	State nursery production
		<i>Acres</i>	<i>Acres</i>	<i>1,000 cubic feet</i>	<i>1,000 trees</i>
Alabama	0	72,751	14,682	0	30,644
Alaska	120	370	370	12	586
American Samoa	24	3	0	0	6
Arizona	182	4,129	252	1,544	0
Arkansas	1,870	32,223	1,096	16	19,188
California	3,391	9,136	2,673	14,800	2,887
Colorado	1,284	2,319	312	3,257	1,959
Com. of N. Marianas	3	20	20	0	9
Connecticut	343	655	200	0	1,300
Delaware	833	667	537	483	0
Florida	2,988	54,648	10,286	2,514	27,349
Georgia	11,641	124,991	18,784	0	67,993
Guam	22	55	30	0	44
Hawaii	198	909	215	10	368
Idaho	3,914	755	2,138	257	780
Illinois	16,760	9,887	5,179	913	5
Indiana	3,881	7,338	6,657	1,881	7,686
Iowa	2,198	7,462	1,990	444	4,001
Kansas	565	308	121	283	175
Kentucky	1,084	5,148	2,559	0	8,969
Louisiana	2,357	37,529	1,835	0	42,723
Maine	2,332	1,546	5,225	97	0
Maryland	2,751	4,577	4,116	2,251	4,600
Massachusetts	1,520	8,150	796	10,835	0
Michigan	1,340	7,877	12,979	13,041	3,320
Minnesota	7,748	18,212	2,301	13,366	18,283
Mississippi	16,316	138,488	12,854	0	52,800
Missouri	2,486	5,431	2,293	2,973	8,000
Montana	620	429	175	2,909	1,457
Nebraska	383	202	0	802	0
Nevada	553	205	2,900	265	275
New Hampshire	3,248	395	445	219	500
New Jersey	838	633	659	779	425
New Mexico	58	1,511	87	600	45
New York	1,609	1,812	2,225	2,507	5,300
North Carolina	6,881	89,953	4,984	0	28,646
North Dakota	610	255	3	32	877
Ohio	6,910	4,698	4,331	2,344	6,937
Oklahoma	980	1,690	1,050	499,368	2,845
Palau	2	3	10	0	7
Pennsylvania	3,089	1,425	2,447	1,563	3,261
Puerto Rico	799	509	215	0	314
Rhode Island	457	288	407	147	0
South Carolina	3,588	57,407	3,643	0	44,655
South Dakota	633	1,897	251	538	1,768
Tennessee	2,609	7,203	243	2,470	5,816
Texas	1,916	25,301	4,267	4,993	27,329
Utah	114	53	40	285	177
Vermont	4,419	2	1,793	7,117	500
Virginia	11,806	78,899	28,971	146,426	67,188
Washington	0	9,611	5,023	23,623	10,446

See footnote at end of table.

Table 52--Summary of selected cooperative forest management and processing activities by State--fiscal year 1990--
Continued

State, Commonwealth, or Territory 1/	Woodland owners assisted	Reforestation assistance <i>Acres</i>	Timber stand improvement assistance <i>Acres</i>	Timber sale assistance-- harvest volume <i>1,000 cubic feet</i>	State nursery production <i>1,000 trees</i>
West Virginia	3,812	6,843	2,262	3,268	2,162
Wisconsin	4,351	38,923	7,870	13,884	25,694
Wyoming	237	1,389	1,958	874	0
Total	148,673	887,120	186,759	783,990	540,299

1/ States not listed have no cooperative forest management and processing activities.



Report of the Forest Service

Table 53—Small watershed protection accomplishments--fiscal years 1986-90 (P.L. 83-566, Act of 1954) 1/

	Unit of measure	1990	1989	1988	1987	1986
Land treatment 2/	Acres					
Forest land		10,477	8,735	9,692	5,462	9,785
Cropland		279	2,395	2,079	1,061	2,802
Pastureland		308	156	831	424	1,121
Total land treatment		11,064	11,286	12,602	6,947	13,708
Land owners assisted	Number	1,144	1,238	1,068	372	581

1/ Accomplishments are limited to activities accomplished solely by small watershed protection program funds.

2/ Reported in land use categories consistent with those reported by the Soil Conservation Service.

Table 54—Flood prevention accomplishments--fiscal years 1986-90 (P.L. 78-534, Act of 1944) 1/

	Unit of measure	1990	1989	1988	1987	1986
Land treatment 2/	Acres					
Forest land		4,457	15,349	6,742	6,399	18,702
Cropland		970	253	454	793	925
Pastureland		188	259	182	317	370
Total land treatment		5,615	15,861	7,378	7,509	19,997
Land owners assisted	Number	2,116	2,091	2,932	5,113	3,416

1/ Accomplishments are limited to activities accomplished solely by small watershed protection program funds.

2/ Reported in land use categories consistent with those reported by the Soil Conservation Service.

Table 55--Forest Research funding--fiscal year 1990 compared to long-term program trends

	1990 Actual 1/ <i>Constant 1990 dollars 1,000 dollars</i>	1995 RPA 2/	Percent of 1990 Actual to 1995 RPA	
Appropriated funds				
Forest protection research	34,742	53,000	66	
Resource analysis research	27,052	39,000	69	
Forest management and utilization research	53,818 3/	69,000	78	
Forest environment research	35,313	57,000	62	
Special projects, competitive grants	0	- 4/	N/A	5/
Research Challenge Cost-Share program	0	-	N/A	
Subtotal	150,925	218,000	106	
Research construction	4,408	-	N/A	
Total, appropriated accounts	155,333			
Reimbursable accounts	10,253	-	N/A	
Grand total	165,586	N/A	N/A	

1/ Post sequestration with supplemental.

2/ Information from 1990 RPA Program.

3/ Actual 1990 funding for forest management plus forest products and harvesting research.

4/ Not reported in the RPA Program.

5/ Not applicable.

Report of the Forest Service

Table 56--Forest Research funding--fiscal years 1986-90 1/

	1990 2/	1989	1988	1987	1986
<i>1,000 dollars</i>					
Appropriated funds					
Forest protection research	34,742	33,181	31,490	31,224	27,902
Resource analysis research	27,052	25,617	25,353	24,644	22,735
Forest management research	32,216	26,972	26,548	23,891	21,501
Forest environment research	35,313	31,100	29,259	28,154	23,922
Forest products and harvesting research	21,602	20,497	19,860	18,808	17,560
Special projects, competitive grants 3/	0	0	(3,000)	(6,000)	(6,507)
Research Challenge Cost-Share program	0	500 4/	0	0	0
Subtotal	150,925	137,867	132,510	126,721	113,620
Research construction (subtotal)	4,408	1,550	2,908	343	642
Total, appropriated accounts	155,333	139,417	135,418	127,064	114,262
Reimbursable accounts (subtotal)	10,253	12,346	14,152	11,329	9,057
Grand total	165,586	151,763	149,570	138,393	123,319

1/ Budget structure was revised in fiscal year 1989 into five major budget line items. General Administration has been eliminated from individual line items. Total appropriated General Administration is included in tables 2 and 3.

2/ Post sequestration with supplemental.

3/ New account in 1985. Funds are transferred to the Competitive Research Grants Office, Cooperative State Research Service, Department of Agriculture, which administers the competitive grants research program.

4/ New account in 1989; \$100,000 funded within each BLI for fiscal year 1989.

Table 57—Extramural research funded through Forest Service research appropriations--fiscal years 1989-90

Type of recipient	1990		1989	
	<i>1,000 dollars</i>	<i>Number of grants</i>	<i>1,000 dollars</i>	<i>Number of grants</i>
Domestic grantees:				
Universities and colleges:				
Land Grant research institutions	9509	388	11,297	340
1890 Land Grant and predominately black institutions	340	18	94	4
Other non-Land Grant institutions	1820	53	2,069	44
Subtotal, universities and colleges	11,669	459	13,460	388
Other domestic:				
Industrial firms	0	0	0	0
Profit organizations	0	0	37	2
Nonprofit institutions and organizations	774	21	1,510	42
Federal, State, and local governments	404	19	507	19
Private individuals	65	5	37	4
Small business innovation research	231	13	361	9
Subtotal, other domestic	1,474	58	2,452	76
Total, domestic	13,143	517	15,912	464
Foreign grantees:				
Universities and colleges	52	5	41	3
Nonprofit institutions and organizations	0	0	0	0
Private individuals	24	2	80	6
Total, foreign grantees	76	7	121	9
Grand total	13,219	524	16,033 1/	473

1/ Number included funds received from other Federal and private sources.

Report of the Forest Service

Table 58—Research publications by major subject area--fiscal years 1987-90

	Number of publications			
	1990	1989	1988	1987
Environmental Research:				
Watershed management	112	96	156	134
Wildlife	121	147	156	162
Range	51	59	82	92
Fisheries habitat	27	17	38	27
Urban and community forestry	58	17	31	42
Disturbed areas rehabilitation	51	50	33	19
Atmospheric deposition and air pollution	180	123	59	36
Subtotal	600	509	555	512
Insect and Disease Research:				
Insect detection and evaluation	42	34	52	54
Insect biology	43	57	44	96
Insect control and management strategies	92	69	63	90
Disease detection and evaluation	37	43	19	67
Disease biology	68	44	54	46
Disease control and management strategies	55	31	51	24
Mycorrhizae	24	25	42	17
Wood products organisms	22	25	14	17
Subtotal	383	328	339	411
Fire and Atmospheric Sciences Research:				
Fire prevention, hazard reduction, and prescribed burning	22	-	35	20
Fire management methods and systems	16	-	27	20
Fire physics, chemistry (science) and behavior	13	7	14	28
Fire economics and management	8	15	-	-
Fire ecological relations and effects	25	34	37	18
Meteorology and climatology weather modification and effects	7			
Air resource management	14	19	10	17
Subtotal	105	88	123	103
Forest Management Research:				
Forest biology	90	118	173	160
Silviculture and management	160	176	153	153
Growth and yield	92	83	127	66
Genetics and tree improvement	65	89	72	78
Subtotal	407	466	525	457

Table 58—Research publications by major subject area--fiscal years 1987-90--Continued

	Number of publications			
	1,990	1989	1988	1987
Economics, Marketing and Recreation Research:				
Forest resource inventory and analysis	120	109	203	138
Forest economics	159	190	131	196
Forest recreation	82	54	44	62
Subtotal	361	353	378	396
Products and Engineering Research:				
Forest engineering systems	46	40	57	70
Wood structural engineering	50	47	71	51
Chemistry, fiber, and fuel products	43	90	25	60
Utilization potential and processing of wood	99	54	77	128
Protection of wood in use	22	24	55	29
Subtotal	260	255	285	338
General	49	79	22	20
Grand total	2,165	2,078	2,227	2,237

Report of the Forest Service

Table 59—Distribution of employees by program and occupational category--selected fiscal years 1/

	1990	1989	1988	1987	1980
Research:					
Clerical	437	470	467	488	627
Technical/wage system	1,028	1,059	1,029	1,087	968
Administrative	382	379	349	302	302
Professional	1,334	1,317	1,298	1,284	1,452
Subtotal	3,181	3,225	3,143	3,161	3,349
State and Private Forestry:					
Clerical	90	91	92	58	163
Technical/wage system	152	148	136	47	80
Administrative	55	54	52	47	42
Professional	301	294	284	119	347
Subtotal	598	587	564	271	632
National Forest System:					
Clerical	3,927	3,991	4,006	4,121	6,361
Technical/wage system	24,571	25,746	24,928	22,657	30,036
Administrative	3,774	3,672	3,411	3,218	2,370
Professional	10,741	9,770	9,366	9,086	9,082
Subtotal	43,013	43,179	41,711	39,082	47,849
Total	46,792	46,991	45,418	42,514	51,830
Full-time equivalents 2/	42,342	40,912	38,830	36,744	49,005

1/ Beginning with fiscal year 1988, employees in Regional Cooperative Forestry, Forest Pest Management, and Cooperative Fire positions are included in S&PF rather than in NFS, as is shown in previous years.

2/ Includes emergency FTE's. One full-time equivalent = 2,087 hours of paid employment.

Table 60—Distribution of employees by tour of duty--selected fiscal years 1/

	1990	1989	1988	1987	1980
Permanent full-time	31,762	30,467	28,781	27,400	21,421
Other permanent	2,019	2,000	2,118	2,901	15,815
Temporary	13,011	14,524	14,519	15,783	24,043
Total	46,792	46,991	45,418	46,084	61,279

1/ Beginning with FY 1988, data is reported as of the end of the fiscal year and not as of July, as was done in prior years.

2/ Includes all wage system with permanent appointments.

Table 61--Summary of Forest Service Human Resource Programs--fiscal year 1990

	Program funding	Value of work accomplished 2/	Persons served	Percent		Work accomplished 1/	Percent placement	Return per dollar invested
				Women	Minority			
		<i>Million dollars</i>						<i>Dollars</i>
Youth Conservation Corps 2/	Unfunded	3.1	1,238	44	20	190	- 3/	1.48
Job Corps 4/	60.7	19.2	9,354	13	42	3,876	91	- 3/
Senior Community Service Employment Program 4/	22.9	36.7	5,842	37	21	2,763	16	1.6
Volunteers in the National Forests 5/	Unfunded	30.2	97,227	30	8	2,083	- 3/	- 3/
Hosted programs	Unfunded	16.5	12,288	16	37	1,055	- 3/	- 3/
Total	83.6	105.7	125,949	-	-	9,967	-	-

1/ Person years.

2/ Funds were not directly appropriated for Youth Conservation Corps; the Congress earmarked not less than \$1 million to be expended from funds available to the Forest Service. We operated a \$2.1 million YCC program.

3/ -- = not applicable.

4/ Statistics are for the July 1, 1989, through June 30, 1990, program year.

5/ Statistics include 6,600 Touch America Project (TAP) enrollees.

Table 62--Summary statement of receipts and obligations--fiscal years 1989-90 1/

	1990		1989		Percent of Change 1989 to 1990	
	Receipts	Obligations	Receipts 1,000 constant 1990 dollars	Obligations	Receipts	Obligations
National Forest programs						
Cash receipts:						
Sale of timber and use of other forest resources	938,050	0	1,047,474	0	-10	0
Use of National Grasslands & land utilization areas	33,286	0	55,881	0	-40	0
Timber sale area betterment (K-V) 2/	206,489	0	253,791	0	-19	0
Cooperative work for others	53,648	0	55,185	0	-3	0
Brush disposal	47,121	0	57,179	0	-18	0
Miscellaneous (sales, rentals, damages, etc.) 3/	5,472	0	9,296	0	-41	0
Restoration of forest lands and improvements	94	0	128	0	-27	0
Golden Eagle Passports	8	0	-9	0	-185	0
Timber salvage sales	163,383	0	138,555	0	18	0
Operation & maintenance of quarters	6,076	0	5,930	0	2	0
Gifts, donations, and bequests	1,749	0	2,195	0	-20	0
Subtotal	1,455,376	0	1,625,604	0	-10	0
Cash receipts from NFS lands collected in conjunction with, and deposited to, accounts of other agencies	127,712	0	190,423	0	-33	0
Non-cash income (roads built by timber purchasers)	104,864	0	111,868	0	-6	0
Total	1,687,952	0	1,927,895	0	-12	0
Obligations						
Operating costs	0	2,825,965	0	2,676,564	0	6
Capital outlay	0	263,734	0	207,975	0	27
Total	0	3,089,699	0	2,884,539	0	7
Other Forest Service programs						
Forest Research programs:						
Forest research	0	151,113	0	152,451	0	-1
Research construction	0	4,383	0	646	0	579
Cooperative research work 4/	0	4,215	0	3,123	0	35
Gifts, donations, and bequests for forest	3	1,821	2	2,421	43	-25
rangeland research	0	1,546	0	2,081	0	-26
Tongass Timber Supply Fund	0	0	0	0	0	0
Energy security reserve	0	0	0	0	0	0
Subtotal	3	163,078	2	160,721	43	1

See footnotes at end of table.

Table 62--Summary statement of receipts and obligations--fiscal years 1989-90--Continued

	1990		1989		Percent of Change 1989 to 1990	
	Receipts	Obligations	Receipts	Obligations	Receipts	Obligations
	1,000 constant 1990 dollars					
State and Private Forestry programs						
State and Private Forestry cooperation	0	114,930	0	86,290	0	0
Rural community fire protection	0	3,010	0	3,210	0	0
Flood prevention and watershed protection	0	3,011	0	2,558	0	0
Licensee programs (Woodsy Owl and Smokey Bear)	115	433	81	-68	42	-734
Forestry Incentives and other programs 5/	0	1,868	0	2,002	0	0
Subtotal	115	123,252	81	93,992	42	31
Human Resource programs						
Job Corps	0	62,967	0	63,884	0	0
Senior Community Service Employment	0	22,566	0	23,126	0	0
Subtotal	0	85,533	0	87,010	0	-2
Grand total, all programs	1,688,070	3,461,562	1,927,977	3,226,263	-12	7
Cash receipts distributed to States, counties and Puerto Rico						
Payments to States and Puerto Rico	0	358,245	0	371,496	0	0
Payment to Minnesota	0	1,252	0	1,172	0	0
Payments to counties, (National Grasslands and Land Utilization Areas)	0	14,757	0	7,546	0	0
Subtotal	0	374,254	0	380,214	0	-2
Internal equipment and supply service (Working Capital)	110,053	114,483	106,677	124,700	3	-8
Reimbursements for work performed for government and others included above	0	73,892	0	76,383	0	0

1/ Obligations were incurred on a "charged-as-worked" basis.

2/ K-V = Knutson-Vandenberg.

3/ Includes sale of personal property and acquisitions of lands to complete land exchanges.

4/ Receipts not available as a separate item after FY 1987.

5/ Includes Resource Conservation and Development, River Basins, and Pesticide Impact assessment funds transferred from Agricultural Research Service.

Report of the Forest Service

Table 63--Summary statement of values and obligations--fiscal year 1990

Item	Units 1/	Quantity	Average value per unit	Total value
				<i>Million dollars</i>
Value:				
Minerals				
Common variety	-	-	-	70.0 2/
Locatable	-	-	-	780.0 2/
Leasable				
Oil	M BBL	18,000	30.00	540.0
Gas	MMCF	210,000	1.87	392.7
Coal	M tons	75,000	30.00	2,250.0
Others				
Timber	MBF	10,482	113.30 3/	1,187.6
Recreation	M RVD	263,051 4/	25.90 4/	5,415.5 4/
Wilderness and primitive areas	M RVD	11,959	34.18	408.8
Wildlife and fish				
Recreation	M WFUD	42,000	50.15	2,106.3
Commercial	M pounds	169,000	1.04	175.8
Range 5/	M AUM	9,579	6.89	66.0
Water 6/				
Increased water yield	M acre feet	-	-	-
Total value				13,392.7
Expenditures:				
National Forest System				3,089.7
Forest Research				163.1
State and Private Forestry				123.3
Human Resource Programs				85.5
Working Capital Fund				114.5
Total expenditures				3,576.1
Net value, total				9,816.6
Net value, National Forest System only				10,303.0

1/ M BBL = thousand barrels; MMCF = million cubic feet; M tons = thousand tons; MBF = thousand board feet; M RVD = thousand recreation visitor days; M pounds = thousand pounds; M AUM = thousand animal unit months; M WFUD = thousand wildlife fish user days; AF = acre feet.

2/ Information provided by Washington Office Minerals staff.

3/ Actual value at time of sale.

4/ Includes wilderness, wildlife, and fish. Total value calculation for M RVD's has Recreation M WFUD's and Wilderness M RVD's excluded.

5/ Based on permitted to graze animal unit months of forage. Value is a Forest Service-wide weighted average based on maximum ability to pay. Ability to pay reflects income derived by the user from use of the resource.

6/ No values available for 1990; values will be available for 1991.



F.S. Photo

Table 64--Statement of receipts--fiscal years 1986-90

	1990	1989	1988	1987	1986
	<i>1,000 dollars</i>				
Receipts from sale and use of forest resources					
Timber and forest products					
Grazing	849,468	909,516	888,373	807,941	745,132
Land uses	10,418	10,949	8,738	8,104	8,617
Recreation	5,008	4,508	4,472	4,394	4,073
Power	41,335	38,132	34,307	30,579	30,275
Minerals	991	871	824	688	765
	64,116	86,838	43,447	46,688	42,913 1/
Subtotal	971,336	1,050,814	980,161	898,394	831,775
Receipts from deposits for expenditures on National Forests					
Timber sale area betterment	206,489	241,706	238,002	196,695	156,092
Timber salvage sales	163,383	131,957	29,174	18,137	20,677
Brush disposal	47,121	54,456	58,606	61,214	52,936
Restoration of Forest Service lands and improvements	94	122	80	183	176
Cooperative work	53,648	52,557	58,332	53,743	43,423
Operation and maintenance of quarters	6,076	5,648	5,610	5,730	5,352
Gifts, donations, and bequests	1,749	2,090	1,577	45	25
Subtotal	478,560	488,536	391,381	335,747	278,681
Other receipts					
Miscellaneous (sales, rents, etc.)	5,438	8,505	9,889	11,947	10,644
Golden Eagle passports	8	-9	23	5	3
Sale of personal property	21	23	3	12	17
Cooperative research 2/	0	0	0	3,581	3,001
Royalties from sale of Smokey Bear and Woodsy Owl products	115	77	106	87	96
Acquisition of lands to complete land exchanges	13	325	325	385	1,573
Gifts, donations, and bequests for forest rangeland research	3	2	3	27	0
Subtotal	5,598	8,923	10,349	16,044	15,334

See footnotes at end of table.

Table 64--Statement of receipts--fiscal years 1986-90--Continued

	1990	1989	1988	1987	1986
			1,000 dollars		
Other income					
Estimated collections by Department of Energy for power licenses on proclaimed National Forest land	1,720	1,722	1,175	601	439
Estimated collections by Department of the Interior for mineral leases on proclaimed National Forest land	125,992	179,633	137,354	102,913	77,286
Value of roads built by timber purchasers applied in lieu of cash payment for timber	104,864	106,541	98,002	104,263	117,026
Subtotal	232,576	287,896	236,531	207,777	194,751
Total	1,688,070	1,836,169	1,618,422	1,457,962	1,320,541
Other net deposits					
Monies advanced on active timber sales 3/					
Balance from previous year	260,668	253,237	247,250	219,872	192,180
Deposited current year	1,380,031	1,397,928	1,350,365	1,169,636	1,014,971
Transferred to other accounts	-1,402,604	-1,390,497	-1,344,378	1,142,258	-987,279
Balance on deposit	238,095	260,668	253,237	247,250	219,872
Amounts deposited pending disposition 4/					
Balance from previous year	28,351	27,610	16,492	9,396	18,553
Deposited current year	-6,393	9,609	14,790	11,943	20,072
Transferred to other accounts	-2,662	-8,868	-3,672	-4,847	-29,229
Balance on deposit	19,296	28,351	27,610	16,492	9,396
Subtotal	257,391	289,019	280,847	263,742	229,268
Total	1,945,461	2,125,188	1,899,269	1,721,704	1,549,809

1/ Includes \$19 million adjusted windfall profit tax payment for 1980-84.

2/ Not available as a separate item after 1987. Included in Cooperative Work, above.

3/ Timber sale deposits made by timber purchasers.

4/ Budget clearing account.

Table 65--Statement of receipts--fiscal year 1990

	National Forests	Oregon and California grant lands	National Grasslands & L.U. Areas 1/ 1,000 dollars	Other	Total
Receipts from sale and use of forest resources					
Timber and forest products	822,700	26,763	5		849,468
Grazing	9,133	4	1,281		10,418
Land uses	4,748	3	256		5,007
Recreation	41,218	105	13		41,336
Power	982		9		991
Minerals	32,394	0	31,722		64,116
Subtotal	911,175	26,875	33,286		971,336
Receipts from deposits for expenditures on National Forests					
Timber sale area betterment	206,489				206,489
Timber salvage sales	163,383				163,383
Brush disposal	47,121				47,121
Restoration of Forest Service lands and improvements	94				94
Cooperative work	53,648				53,648
Operation and maintenance of quarters	6,076				6,076
Gifts, donations, and bequests	1,749				1,749
Subtotal	478,560				478,560
Other receipts					
Miscellaneous (sales, rents, etc.)				5,438	5,438
Golden Eagle passports				8	8
Sale of personal property				21	21
Cooperative research 2/				0	0
Royalties from sale of Smokey Bear and Woodsy Owl products				0	0
Acquisition of lands to complete land exchanges				115	115
Gifts, donations, and bequests for forest rangeland research				13	13
				3	3
Subtotal				5,598	5,598

See footnotes at end of table

Table 65--Statement of receipts--fiscal year 1990--Continued

	National Forests	Oregon and California grant lands	National Grasslands & L.U. Areas 1/	Other	Total
<i>1,000 dollars</i>					
Other income					
Estimated collections by Department of Energy for power licenses on proclaimed National Forest land	1,720				1,720
Estimated collections by Department of the Interior for mineral leases on proclaimed National Forest land	125,992				125,992
Value of roads built by timber purchasers in lieu of cash	104,864				104,864
Subtotal	232,576				232,576
Total	1,622,311	26,875	33,286	5,598	1,688,070
Other net deposits:					
Monies advanced on active timber sales					
Balance from previous year	260,668				260,668
Deposited current year	1,380,031				1,380,031
Transferred to other accounts	-1,402,604				-1,402,604
Balance on deposit	238,095				238,095
Amounts deposited pending disposition					
Balance from previous year	28,351				28,351
Deposited current year	-6,393				-6,393
Transferred to other accounts	-2,662				-2,662
Balance on deposit	19,296				19,296
Subtotal	257,391				257,391
Grand total	1,879,702	26,875	33,286	5,598	1,945,461

1/ Land Utilization Projects.

2/ Not available as a separate item after FY 1987. Included in Cooperative Work, above.

Report of the Forest Service

Table 66—Statement of obligations--fiscal year 1990 1/

	Total	Work for other public agencies (reimbursables) 1,000 dollars
National Forest System:		
Protection and management	665,096	22,206
Fighting forest fires	718,609 2/	2,686
Cooperative work for others	52,294	0
Cooperative law enforcement	11,061	0
Flood prevention and watershed protection	317	1
Restoration of forest lands and improvements	79	0
Reforestation and timber stand improvement 3/	86,388	0
Timber sale betterment (K-V) 4/	437,308	2
Brush disposal	61,384	3
Timber salvage sales	111,006	0
Oregon and California grant lands	-2	0
Range betterment	4,064	0
Construction of facilities	41,956	6,478
Acquisition of lands, Forest Service	1,458	0
Acquisition of lands, Land and Water Conservation Fund	60,284	-10
Construction of forest roads and trails	172,702	466
Timber purchaser roads constructed by the Forest Service	2,946	0
Restoration of roads, Federal Highway funds	7,967	0
Road construction, Mount St. Helens, highway trust	237	0
Road and trail maintenance	106,666	2
Mount St. Helens emergency activities	0	0
Tongass Timber Supply Fund	49,923	38
General Administration	271,399	0
Operation & maintenance of quarters	5,988	0
Hazardous waste management	12,522	0
Department of Transportation-Coast Guard	884	0
Resource management timber receipts	37,034	1
Fire protection	170,136	457
Quinalt Special Management Area	-7	0
Subtotal	3,089,699	32,330
Research:		
Tongass Timber Supply Fund	1,546	0
Forest research	151,113	10,620
Construction of research facilities	4,383	500
Cooperative research	4,215	0
Energy security reserve, DOE		0
Gifts, donations, and bequests for forest and rangeland research	1,821	0
Subtotal	163,078	11,120

See footnotes at end of table.

Table 66--Statement of obligations--fiscal year 1990--Continued

	Total	Work for other public agencies (reimbursables)
State and Private Forestry:		
Cooperation and general forestry assistance	114,930	6,818
Resource conservation and development	722	0
Rural community fire protection grants	3,010	0
River basins	819	0
Flood prevention and watershed planning	3,011	0
Licensee programs (Smokey Bear and Woodsy Owl)	433	0
Pesticide Impact Assessment	327	0
Subtotal	123,252	6,818
Human Resource Programs:		
Job Corps	62,967	1,058
Senior Community Service Employment Program	22,566	22,566
Subtotal	85,533	23,624
Total	3,461,562	73,892
Internal equipment and supplies service:		
Working Capital Fund	114,483	114,483
Grand total	3,576,045	188,375

1/ Obligations were incurred on a "charged-as-worked" basis.

2/ \$726 million for suppressing fires in FY 1990, and \$8 million due to duplicated obligations as of September 30, 1989.

3/ Includes obligations of \$28,334,627.64 for Reforestation Trust Fund.

4/ K-V = Knutson-Vandenberg Act.

Report of the Forest Service

Table 67—Statement of obligations--fiscal years 1986-90

	1990	1989	1988	1987	1986
<i>Million dollars</i>					
National Forest System	3,089.7	2,747.2	2,254.6	1,967.9	1,718.7
Forest Research	163.1	153.1	153.2	143.1	127.9
State and Private Forestry	123.3	89.5	98.7	71.2	66.6
Human Resource Programs	85.5	82.9	83.4	78.1	78.2
Working Capital Fund	114.5	118.7	102.8	90.2	86.9
Total	3,576.1	3,191.4	2,692.7	2,350.5	2,078.3



F.S. Photo

INDEX

A

- Administration 97
 - Earth Day 103
 - hotline for fall colors 104
 - hosted programs 100
 - improving agency productivity 98
 - Job Corps 99
 - keeping people informed and involved 102
 - law enforcement 101
 - managing the capital resource 101
 - managing the human resource 98
 - managing the information resource 102
 - Native American employment programs 98
 - procurement and property 102
 - receipts and expenditures 101
 - Take Pride in America 100
 - total quality management 98
 - USDA Demonstration Program 98
 - workforce distribution 98
 - Youth Conservation Program 99
- Air resource management 57
- America the Beautiful initiative 74, 103
- Appeals, forest plans 34

B

- Bacillus thuringiensis* 72, 86
- Boise Interagency Fire Center 69
- Burton-Santini Act 78

C

- Chief's message 4
- Conservation Reserve Program 76
- Cooperative fire protection 70
 - Federal excess personal property 71
 - Rural Fire Prevention and Control Program 70
 - Smokey Bear Fire Prevention Program 71
 - Federal disaster assistance 71
 - Rural Community Fire Protection Program 71
- Cultural resource management 51

D

- Disaster assistance 71
- Diversity, biological 86
- Diversity, workforce 98

E

- Earth Day 103
- Economic Diversification Grant Program 79
- Endangered species 54
- Exchanged lands 37
- Expenditures, receipts and 101

F

- Facilities management, recreation 49
- Farm Bill 74
- Fire 68
 - fire suppression--the 1990 season 68
 - fuels management 69
 - international cooperation 70
 - National Advanced Resource Technology Center 70
- Fish and wildlife (also see wildlife and fish) 52
- Forest pest management (also see S&PF) 72
 - pest management special projects 73
 - pest outbreak and suppression 72
 - pesticide use 73
 - surveys and technical assistance 72
- Forest management and utilization 74
 - cooperative watershed activities 77
 - forest resource management 74
 - forest stewardship 74
 - Forestry Incentives Program 77
 - resource conservation and development 78
 - Rural Development Strategic Plan 75
 - seedlings, nursery, and tree improvement 76
 - Statewide forest resource planning 76
 - taxation 75
 - urban and community forestry 77
 - utilization, marketing, and technology transfer 75

Forest plans 34
Foundation programs 86

G

Grazing fees 45

H

Human resource programs 98
 hosted programs 100
 Job Corps 99
 Senior Community Service Employee Programs 99
 Volunteers 99
 Youth Conservation Corps 99
Hurricane Hugo 78, 88

I

Information management 102
International forestry 94

J

Job Corps 99

L

Land management planning 32
Land management planning critique 34
Lands 37

M

Minerals 35

N

National problems 82
National Forest System 25
 engineering support 62
 Federal Facilities Compliance Program 59
 forest management 39
 forest road system 58
 land management planning 32
 lands 34
 minerals 35
 multiple-use management 26
 range 45
 recreation, wilderness, and cultural resource
 management 47
 soil, water, air, and weather 55
 wildlife and fisheries 52
Northern Forest Lands Study 79

O

Old growth, timber 92
Ottawa National Forest 29

P

Pesticide use 73
Pinchot Institute 79
Pinchot Institute for Conservation Studies 79
Procurement and property 102

R

- Range 45
- Research 81
 - air quality 86
 - automated lumber-processing systems 94
 - biodiversity 91
 - biological control for sound management 86
 - brown-rot decay 87
 - composite materials 94
 - conservation biology 90
 - disturbance and disaster 86
 - ecological research 90
 - even-flow timber sale policies and community stability 89
 - fire-retardant treated plywood 92
 - genome mapping and gene isolation in forest trees 90
 - long-term productivity 90
 - moisture effects on paperboard and containers 93
 - mountain pine beetle 87
 - mined land reclamation 92
 - national timber productivity 88
 - Northeastern decision model 90
 - oak wilt control 87
 - old-growth forests 92
 - pest resistant trees 87
 - rangeland productivity 91
 - recycling in the 1990's 88
 - riparian management 92
 - San Dimas lysimeters 91
 - stand dynamics of loblolly pine 89
 - standard test for fixation of chromated copper arsenate in wood 93
 - termite control 87
 - urban forests 89
 - vegetation classification 88
 - western gall rust 87
 - wetlands conservation and management 90
 - whitebark pine establishment and survival 89
 - wilderness management 89
 - wood-degrading fungi for soil restoration 93
- Resources Planning Act Program and Assessment 13
 - 1989 Assessment Findings by Resource Area 15
 - 1990 Program themes 18
 - implications of the 1989 Assessment findings for the 1990 Program 17
 - transition to the 1990 Program 16
 - summary 23
- Roads
 - construction 58
 - maintenance 62

- reconstruction 58
- rights-of-way 38
- Rural Development Initiative 79
- Rural Development Strategic Plan 68

S

- Salvage sales 43
- Scenic byways 49
- Scenic rivers 49
- Seedlings, nursery and tree improvement 76
- Sensitive species 54
- Siskiyou National Forest 31
- Small Tracts Act 37
- Soil, water, air, and weather 55
- Spotted owl 41, 84
- State and Private Forestry 67
 - cooperative fire protection 70
 - cooperative watershed activities 77
 - economic diversification grant programs 79
 - emergency watershed rehabilitation 78
 - Federal disaster assistance 71
 - Federal excess personal property 71
 - fire protection capability measurement 68
 - fire suppression--the 1990 season 68
 - forest resource management 74
 - forest stewardship 74
 - forestry incentives 77
 - hotline 69
 - international cooperation 70
 - National Advanced Resource Technology Center 70
 - Northern Forest Land Study 79
 - pest management special projects 73
 - pest outbreak prevention and suppression 72
 - pesticide use 73
 - resource conservation and development 78
 - rural community fire protection 71
 - Rural Development Initiative 79
 - Rural Development Strategic Plan 75
 - seedlings, nursery, and tree improvement 76
 - Smokey Bear fire prevention program 71
 - statewide forest resource planning 76
 - surveys and technical assistance 72
 - The Pinchot Institute for Conservation Studies 79
 - The Urban/Wildland Fire Protection Initiative 71
 - Timber Bridge Initiative 79
 - Tropical Forestry Initiative 79
 - urban and community forestry 77

T

Take Pride in America 100
Threatened species 54
Timber Bridge Initiative 86
Timber Sale Program Information Reporting System 43
Timber sold and harvested 40
Timber stand improvement
 NFS chapter 40
 S&PF chapter 74

Trails, recreation 48
Tonto National Forest 26
Total quality management 98
Tree improvement 39
Tropical Forestry Initiative 79

V

Volunteers in the National Forests 99

W

Wild and scenic rivers 49
Wilderness
 legislation 34
 recreation 50
Wildlife and fish
 endangered species 54
 habitat improvement 53
 partnerships 54
 sensitive species 54
 threatened species 54
Woodsy Owl 103
Workforce population 98

Y

Youth Conservation Corps 99

The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

USDA policy prohibits discrimination because of race, color, national origin, sex, age, religion, or handicapping condition. Any person who believes he or she has been discriminated against in any USDA-related activity should immediately contact the Secretary of Agriculture, Washington, DC 20250.

